Report and Environmental Assessment

YELLOWSTONE RIVER BASIN
AND
ADJACENT COAL AREA LEVEL B STUDY

VOLUME 1

Missouri River Basin Commission
November 1978

Cover Photo: Columnar juniper near the Burning Coal Mines south of Medora, N Dak

mrbc

The Missouri River Basin Commission is the principal agency for the coordination of Federal, State, interstate, local and nongovernmental plans for the development of water and related land resources in the area served by the Missouri River and its tributaries. As an independent regional commission, it also provides a forum in whch States meet with Federal agencies to conduct and coordinate water and related land resources planning The Commission's Chairman is appointed by the President. its Vice Chairman is elected from among State members.

MRBC members are Colorado; Iowa; Kansas; Minnesota; Missouri; Montana, Nebraska; North Dakota; South Dakota, Wyoming. Department of Agriculture; Department of the Army; Department of Commerce; Department of Energy; Environmental Protection Agency; Department of Health, Education and Welfare; Depatment of Housing and Urban Development. Department of the Interior; Department of Transportation; Yellowstone River Compact Commission; Big Blue River Compact Administration. Canada is an observer.

REPORT
AND
ENVIRONMENTAL ASSESSMENT

YELLOWSTONE RIVER BASIN AND ADJACENT COAL AREA LEVEL B STUDY

Missouri River Basin Commission
Suite 403, 10050 Regency Circle
Omaha, Nebraska 68114
November 1978

PREFACE

The 123,000-square-mile Yellowstone study area was divided into seven planning areas for study purposes—four in Montana, one in North Dakota, and two in Wyoming. Seven planning area reports were prepared by study teams chaired by the respective assistant study managers assigned to each State. Study team reports are available on a limited basis as follows:

Volume 2 - Upper Yellowstone, Montana
Volume 3 - Clarks Fork-Bighorn, Montana
Volume 4 - Tongue-Powder, Montana
Volume 5 - Lower Yellowstone, Montana
Volume 6 - North Dakota Tributaries
Volume 7 - Wind-Bighorn-Clarks Fork, Wyoming
Volume 8 - Northeast Wyoming

Technical papers prepared by ad hoc work groups during the study provided support and additional detail for the plan and recommendations in this report. These reports are also available on a limited basis from the Missouri River Basin Commission. Titles of major technical papers developed by the ad hoc groups are:

- Analysis of Energy Projections and Implications for Resource Requirements, Harza Engineering Company, December 1976
- Agricultural Projections and Supporting Data
- Flood Damages and Streambank Erosion Damages Along the Main Stem Reaches
- Depletion Study, 1975 Level of Development
- Flood Control and Streambank Erosion Needs, Drainage Areas Less than 400 Square Miles
- Land Conservation Measures
- Outdoor Recreation Update
- Land Use Update
- 1975 Surface Water Quality Conditions Based on 1975 Level Depleted Flows
- Current and Projected Population Income and Earnings
- Legal Constraints on Resource Development in Yellowstone River Basin
- Nonenergy Mineral Industry Water Needs, Yellowstone River Basin Study Area, 1985 and Year 2000
- Surface Coal Mining Impact and Rehabilitations Analysis
- Yellowstone River Basin and Adjacent Coal Fields Operation Study

Environmental assessment information required under the National Environmental Policy Act of 1969 is included in this report. The probable impacts of the recommended plan are discussed in chapter 8 as are the probable environmental effects which cannot be avoided. The alternatives considered with an evaluation of each are shown in chapter 6, tables 37-57, and in chapter 8, tables 65-80. The relationship between local short-term uses of man's environment and maintenance and enhancement of long-term productivity is also shown in chapter 8, tables 65-80. Irreversible and irretrievable commitments of resources are shown in chapter 8, tables 66, 68, 70, 72, 74, 76, 78, and 80. Other environment information is provided throughout the report.

Review comments from the official 90-day review by Commission member States and Federal agencies as required by P.L. 89-80 will be bound in the report as an appendix. This report will then be transmitted to the U.S. Water Resources Council for review and transmittal to the President and by him to the Congress.

The recommended plan and recommendations in the report are to be used as a guide to water and related land resource conservation and management in the Yellowstone River Basin and Adjacent Coal Areas. The plan will be updated through the Commission's comprehensive, coordinated, joint planning process and the involved State's ongoing water planning programs.

ACKNOWLEDGMENTS

The study was conducted under the leadership of the following:

Paul Shore[1], Study Manager[2], Missouri River Basin Commission
Judith Lessard, Secretary[3]

Don Ohnstad, Assistant Study Manager, North Dakota, Missouri River Basin Commission
Lorna Sanders, Secretary

Jeff White[4], Assistant Study Manager, Montana, Missouri River Basin Commission
Emma Cotter, Secretary

Management Group

Paul Shore, Management Group Chairman
Missouri River Basin Commission

Orrin Ferris, Montana
Fletcher Newby, Montana
Gene Krenz, North Dakota
Don Dexter, Wyoming
Frank Trelease, Wyoming

Paul Harley[5], Department of the Interior
John VanDerwalker, Department of the Interior
Wayne Stufft, Corps of Engineers
Blaine Halliday[6], Department of Agriculture
Patrick Godsil, Environmental Protection Agency
Daniel Old Elk, Indian Tribes

Ad Hoc Work Group Leaders

Work Group	***Leader***	***Agency***
Agriculture	Richard Clark	Economics, Statistics & Cooperative Service
Municipal & Rural Domestic Water Requirements	Alf Hulteng	State of Montana
Flood Control & Streambank Erosion - Mainstem	Wayne Stufft	Corps of Engineers
Flood Control & Streambank Erosion - Tributaries	Reuben Kammerer	Soil Conservation Service
Land Conservation Measures	Reuben Kammerer	Soil Conservation Service
Outdoor Recreation Update	Emanuel Louck	Heritage, Conservation & Recreation Service
Land Use Update	Reuben Kammerer	Soil Conservation Service
1975 Level Streamflow	Derwood Mercer	U.S. Bureau of Reclamation
1975 Surface Water Quality	Derwood Mercer	U.S. Bureau of Reclamation
Population, Income and Employment	Richard Clark	Economics, Statistics & Cooperative Service
Legal and Institutional Restraints	A.E. Bielefeld	Department of the Interior
Minerals	Ronald Pense	Bureau of Mines
Strip Mine Reclamation	Ronald Pense	Bureau of Mines
River and Reservoir Operation Studies	Derwood Mercer	U.S. Bureau of Reclamation

State, Federal, special interest group representatives, and private individuals served on the Ad Hoc Work Groups and planning area study teams. Their contributions are acknowledged and their names are shown in the individual Ad Hoc Group Reports and planning area reports that are published separately.

[1] Also served as Assistant Study Manager, Wyoming.
[2] Robert Madsen served as Study Manager July 1975-February 1977.
[3] Bess Munns, DeNae Mayer, and Cindy Rupe each served as Secretary during some part of the study.
[4] Keith Corrigal and Martin Oleson served as Assistant Study Manager, Montana, during some part of the study.
[5] Terry Lynott also served.
[6] Dennie Burns, Reuben Kammerer—alternates.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Background

A comprehensive interagency study for the Yellowstone River Basin in Wyoming and Montana was first recommended by the Missouri Basin Inter-Agency Committee, forerunner of the Missouri River Basin Commission. The recommendation was contained in the committee's Missouri River Basin Comprehensive Framework Study Report, published in December 1971.

The national energy crisis that came to a head with imposition of the Mideast oil embargo in late 1973 placed increased emphasis on resource planning in the Yellowstone River Basin and nearby coal areas. A number of programs and studies had been completed on portions of the areas or on some facet of area problems. It was apparent, though, that there remained some major unresolved problems and conflicts which pointed up an urgent need to update available data and develop a more comprehensive plan for the Yellowstone study area.

The Missouri River Basin Commission (MRBC) gave a high priority in February 1974 to initiation of the Yellowstone River Basin and Adjacent Coal Area Level B Study. State and Federal funding was made available in December 1975, permitting major study efforts to begin in early 1976.

Purpose and Scope

Level B Planning Process

The level B study is regional in scope and involves a reconnaissance-level evaluation of water and related land resources for the Yellowstone River Basin and Adjacent Coal Area. The report includes recommendations for implementation of some projects and programs which are subject to the satisfactory completion of appropriate level C (preconstruction) studies.

Broad objectives established at the beginning of the study include:

—Strong participation by State and local governmental agencies, and by the public-at-large throughout the study;

—Primary focus upon major problems, needs, and issues requiring solutions within the 1975-2000 time frame;

—Coordination and integration of all Federal, State, and local planning programs involving water and related land resources within the study area; and

—Concise presentation of level B results in a main study report with more detailed information in the planning area reports and backup technical papers.

Under the level B approach, a series of plans is developed on a continuously expanding and improving basis, so as to take into account the views, comments, and opinions expressed along the way by study participants, including the public-at-large.

As contrasted with older forms of planning, which were frequently subjected to review only after a nearly completed report was available, the MRBC level B approach encouraged self-examination and self-correction throughout the entire course of study.

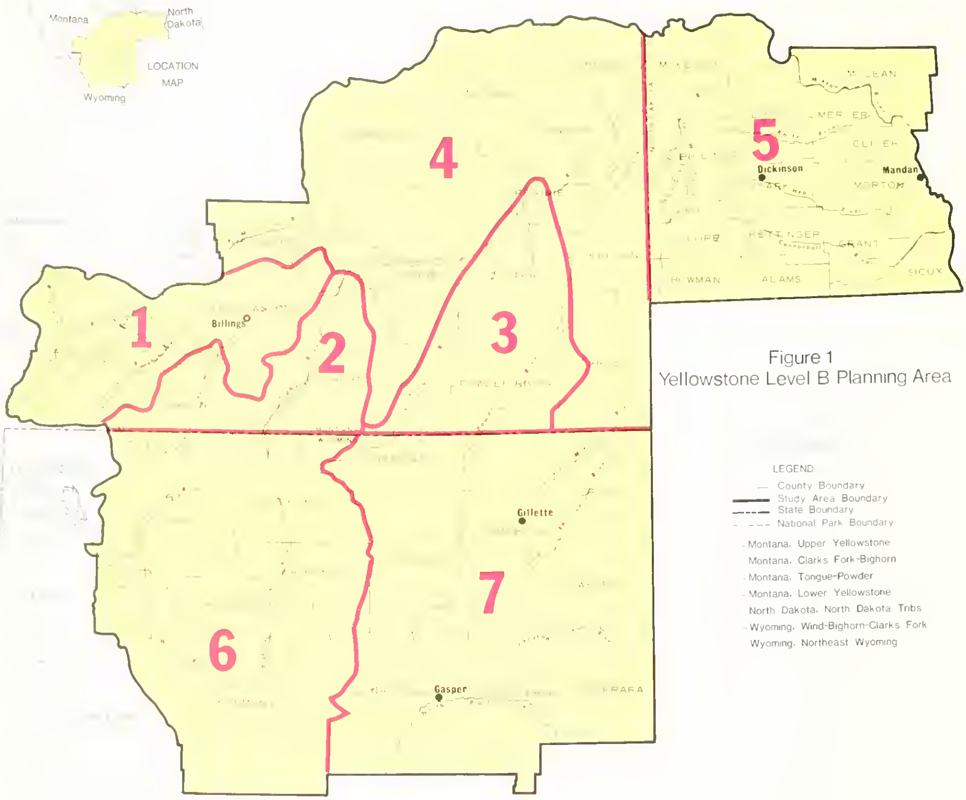


Figure 1
Yellowstone Level B Planning Area

Study Area

The study area includes the drainage of the Yellowstone River and Adjacent Coal Area in southeastern Montana, northern Wyoming, and southwestern North Dakota. It encompasses more than 123,000 square miles in all or part of 52 counties. The size and diversity of the study area produced a wide array of resource problems, issues, and needs. Differences in both the nature and degree of problems, issues, and needs encountered in individual planning areas prompted the decision to prepare individual reports for each of the seven planning areas shown on figure 1.

Study Budget

The Yellowstone study was funded jointly by the Federal Government, through the U.S. Water Resources Council, and the three States participating in the study through the medium of evaluated services. The Federal contribution totaled $1.1 million. The value of anticipated State contributions was estimated at the outset to be $1.3 million.

MRBC was directly responsible for payment to Federal agencies for their participation in the study and for MRBC staff and consultant costs. This centralized funding responsibility, though it applied to Federal agency and staff responsibilities alone, facilitated a more balanced study effort and improved the effectiveness of management. State expenditures charged to the study have not been analyzed.

Organization of the Study

Staff

The Yellowstone study was the responsibility of the MRBC under the general supervision of the MRBC Director of Planning. Full responsibility for the conduct of the study was delegated to the study manager, who provided overall management and guidance. The study manager was assisted in the day-to-day conduct of the study by three assistant study managers, one for each State. The assistant study managers chaired the study teams, composed of Federal and State agency personnel and representatives of the public, that were established for each planning area to develop plans for their portions of the study area.

There was no central staff other than the study manager, assistant study managers, and their respective secretaries.

Management Group

A management group comprising six Federal and six State agency representatives, and one representative from the federated Indian tribes assisted the study manager in developing policy and operating guidelines. The management group also consolidated the planning area reports into this comprehensive summary for the entire study area.

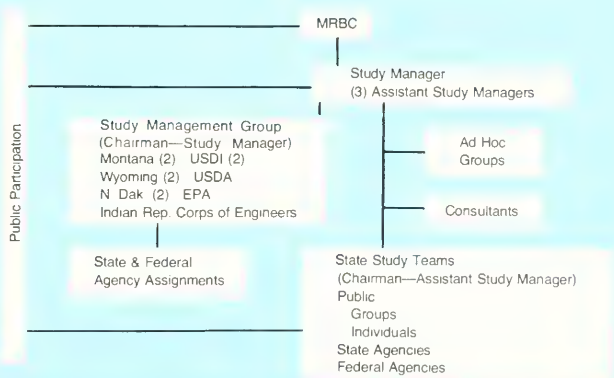
Ad Hoc Groups

During the early phases of the study, certain specific tasks were assigned to ad hoc groups. These groups were composed of Federal and State agency representatives or private individuals or firms possessing the expertise and capability needed to effectively complete their assignments. Most groups prepared functional reports (agriculture, recreation, etc.) defining base conditions (1975), projected future requirements, determined what part of those requirements may be satisfied through private initiative, and derived the remaining needs to be met within the 1975-1985 and 1985-2000 time frame. Other ad hoc groups provided background information and basic statistical data.

State Study Teams

Plan development, analysis, and associated public participation were handled through the study teams under the direction of the assistant study manager in each State. The teams prepared a plan for their respective planning areas using the information supplied to them by the ad hoc committees, individual and agency issue papers, background reports prepared by the staff, and other available material. These plans were then incorporated into a total study area plan by the management group and the study manager. Figure 2 displays the study organization.

Figure 2
YELLOWSTONE BASIN AND ADJACENT COAL AREA
LEVEL B STUDY
ORGANIZATION



State Involvement

This level B study effort was oriented toward a high degree of State agency participation, both in terms of task performance and policy guidance through service on the study management group and on State study teams. Additionally, the States assumed a major role through their cost-sharing portion of the study funding. State involvement was strengthened by ongoing State programs that were running concurrently with the level B study effort. The degree of State agency participation varied widely. Some agencies (and individuals) were very active and assumed leadership roles, while others did not participate at all or limited their activities to review of materials prepared by others.

Public Participation

Public participation was solicited as a means of taking advantage of local knowledge and preferences. It was considered particularly crucial in terms of looking ahead to effective implementation of programs based upon the recommended plans. Considering the large geographic size and diversity of interests in the study area, it was deemed inadvisable to structure a formal organizational entity such as a citizens advisory committee or citizens task force. Direct public participation in the study teams seemed preferable. Interest groups within the area, both developmental and environmental, were already fairly well organized, and many of their representatives participated regularly as study team members. Members of the general public also participated directly on the study team or, at their option, attended and participated in selected study team meetings. All meetings were publicized by appropriate news releases that invited public attendance and participation.

Individual citizens and a wide spectrum of interest groups had unlimited opportunity for direct involvement through all phases of plan formulation.

Interstate and Planning Area Coordination

Planning for drainage areas crossing State boundaries was accomplished in three ways: (1) the assistant study managers for the respective States maintained constant communication, directly and through the study manager; (2) joint planning meetings between selected members of the affected study teams were scheduled when conflicts were evident in planning philosophies or resource availabilities; and (3) the management group reviewed progress and interarea problems on a continuing basis during the plan formulation process. This process provided adequate coordination to provide compatibility overall but, at the same time, permitted enough freedom at the local and State levels to allow the plans to reflect local conditions and preferences. No joint developments directly involving more than one State were recommended, only because none seemed essential or advantageous.

Regional and Planning Area Goals and Objectives

Objective

The objective of the Yellowstone Study was to identify the best options for use of natural resources to meet as many of the area's and the Nation's needs as is practicable within the physical, social, and institutional constraints that have been or may be imposed.

In order to meet this objective, a major effort was directed toward identifying the area's problems and needs and finding reasonable and acceptable solutions. Conflicts over use of the area's natural resources were mainly between those who would divert water from the streams and rivers for out-of-stream uses and those who prefer leaving the water as instream flows.

Principles and Standards

The Water Resources Council's principles and standards provided the basis for the preparation,

formulation, and evaluation of the plans presented in this report. These principles and standards are based on the premise that nationally the overall purpose of water and land resource planning is to promote the quality of life by reflecting society's preferences for attainment of objectives designed to:

> (a) Enhance national economic development by increasing the value of the Nation's output of goods and services and improving national economic efficiency; and
>
> (b) Enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

To provide a basis for comparisons and trade--offs, single-objective plans were developed for each planning area. In order to qualify for the national economic development plan (NED), the direct benefits from nationally needed production made possible by the project or program had to exceed the total identifiable and quantifiable costs. To qualify for the environmental quality plan (EQ), a program was required to produce identifiable—but not necessarily quantifiable—environmental, social, or other benefits that were deemed to be in excess of the environmental, social, and economic costs.

The study effort also included an analysis of projects, plans, or elements to test their acceptability and need for meeting State-regional goals. To qualify for State-regional development (SRD), the project, program, or element had to be ineligible for inclusion in either the optimized NED or emphasized EQ Plan; it had to be funded 100 percent nonfederally; and its total benefits (including induced by and stemming from external economies, user benefits, unemployed and underemployed resource benefits and construction benefits) had to be in excess of total economic costs.

For each plan, there is a complete display or accounting of relevant beneficial and adverse effects. The extent to which plans contribute either in a beneficial or adverse way in serving the objectives, as well as their impacts on social well-being, have been evaluated to provide the means for an appraisal of individual projects and programs.

Plan Evolution

The recommended plan presented in this report is the culmination of a process which produced individual plans for each of the seven planning areas. The idea of developing and publishing individual planning area reports, which would later be brought together in a single summary report for the entire study area, came about for basically two reasons: (1) because of the obvious difference in problems, issues, and needs found in the individual planning areas; and (2) because it was felt that the significance of actions called for in individual planning areas would be diminished or lost if such actions were combined with those for other planning areas and presented in a study area context. The planning area reports, which contain considerably more detail than does this summary report, are bound separately as supporting data and are numbered volumes 2-8 for convenient reference.

To better define potential problems during the early phases of the study, the staff identified and prepared papers on four functional areas:

1. Food and fiber production;
2. Instream flow levels and water quality;
3. Impact of energy development upon the water and land resource base; and
4. Indian water resource problems.

These papers served as background information and provided guidance for the identification of tasks to be performed. To identify local problems and opportunities, individual study team members were requested to prepare issue papers which reflected either their own or agency views on what should or should not be done in the study area to best serve the interests of the people who live there.

Following preparation of issue papers, the team considered all of the various programs and projects suggested by individual members and identified those deemed compatible and that would best meet area needs. This sort of reiterative give-and-take led to the analyses summarized in the following chapters of this report.

CHAPTER 2

THE STUDY AREA AND ITS RESOURCES

This chapter provides a summary of the physical characteristics, natural resources, and land utilization in the study area based on currently available published reports or file documents. The absence of opportunity to gather new field data as a part of this study prevented the establishment of an up-to-date ecological baseline against which air quality and some other environmental impacts could be evaluated. In general, however, the baseline data for the area is adequate for reconnaissance-level planning.

Physical Description

The Yellowstone study area is a land of diverse physical attributes, political systems, and social attitudes. The study area (see figure 1), which encompasses 78,959,645 acres, was divided into 7 planning areas along a combination of hydrologic, State, and county boundaries. The planning areas are described as follows:

1. UPPER YELLOWSTONE—The Yellowstone River and its tributaries (except Clarks Fork) located above the mouth of the Bighorn River *within Montana,* excluding Yellowstone National Park.

2. CLARKS FORK-BIGHORN—The Clarks Fork and Bighorn Rivers and their tributaries *within Montana.*

3. TONGUE-POWDER—The Tongue and Powder Rivers and their tributaries *within Montana.*

4. LOWER YELLOWSTONE—The Yellowstone River and its tributaries (except the Tongue and Powder Rivers) located below the mouth of the Bighorn River *within Montana.* (Includes the Little Missouri River and Belle Fourche River tributaries within Montana and the remaining parts of Custer, Dawson, Garfield, McCone, Musselshell, Prairie, Richland, Rosebud, and Yellowstone Counties located in the Upper Missouri River drainage.)

5. NORTH DAKOTA TRIBUTARIES—The Yellowstone, Little Missouri, Knife, Heart, Cannonball, and Grand Rivers and their tributaries within North Dakota and McLean County.

6. WIND-BIGHORN-CLARKS FORK—The Clarks Fork and Wind-Bighorn Rivers and their tributaries within Wyoming, excluding Yellowstone National Park. (Includes all of Fremont County and a part of the Yellowstone drainage in Teton County.)

7. NORTHEAST WYOMING—The Tongue, Powder, Little Missouri, Belle Fourche, and Cheyenne Rivers and their tributaries within Wyoming and the remaining parts of Converse, Natrona, and Niobrara Counties located in the Platte and Niobrara River drainages.

The total surface area of land and water located in each planning area and State is shown in table 1.

Climate

Climate within the study area is extremely varied. Overall, it can be classified as semiarid with cold winters and hot summers. Weather patterns and systems include moist Pacific-maritime fronts in the spring and fall, polar-continental cold fronts in the winter, and moist tropical air masses originating in the Gulf of Mexico during the summer. The western parts of the area are influenced primarily by Pacific and polar weather systems, while the eastern portions are influenced more by continental and tropical systems. The eastern portions receive greater precipitation but have shorter growing seasons and colder winter temperatures than areas to the west.

Significant climatic events include a large percentage of precipitation during the growing season, periodic droughts, and severe summer storms. The favorable precipitation during the growing season permits substantial agricultural production. This precipitation pattern is often interrupted by long and severe drought, however, as occurred in the 1930's and to a lesser extent in the early 1950's and 1960's. Summer rains, which often occur in the form of thunderstorms, can be accompanied by hail and high winds or tornadoes.

Figure 3 shows precipitation isohyets for the study area. The influence of the mountains is evident, both in terms of increased precipitation in the mountains and decreased rainfall in rain-shadow areas such as the Bighorn Basin.

Table 1
SURFACE AREA BY PLANNING AREA

State and Planning Area	Land	Water	Total
	----------	Acres	----------
Montana			
Upper Yellowstone	5,900,775	36,552	5,937,327
Clarks Fork-Bighorn	3,442,990	24,570	3,467,560
Tongue-Powder	5,236,288	29,304	5,265,592
Lower Yellowstone	17,302,717	330,589	17,633,296
Subtotal	(31,882,770)	(421,015)	(32,303,775)
North Dakota			
North Dakota Tributaries	13,562,792	409,050	13,971,840
Wyoming			
Wind-Bighorn-Clarks Fork	14,497,853	108,577	14,606,430
Northeast Wyoming	17,963,911	113,689	18,077,600
Subtotal	(32,461,764)	(222,266)	(32,684,030)
Study Area	77,907,326	1,052,331	78,959,645

Source Level B Land Use Ad Hoc Report.

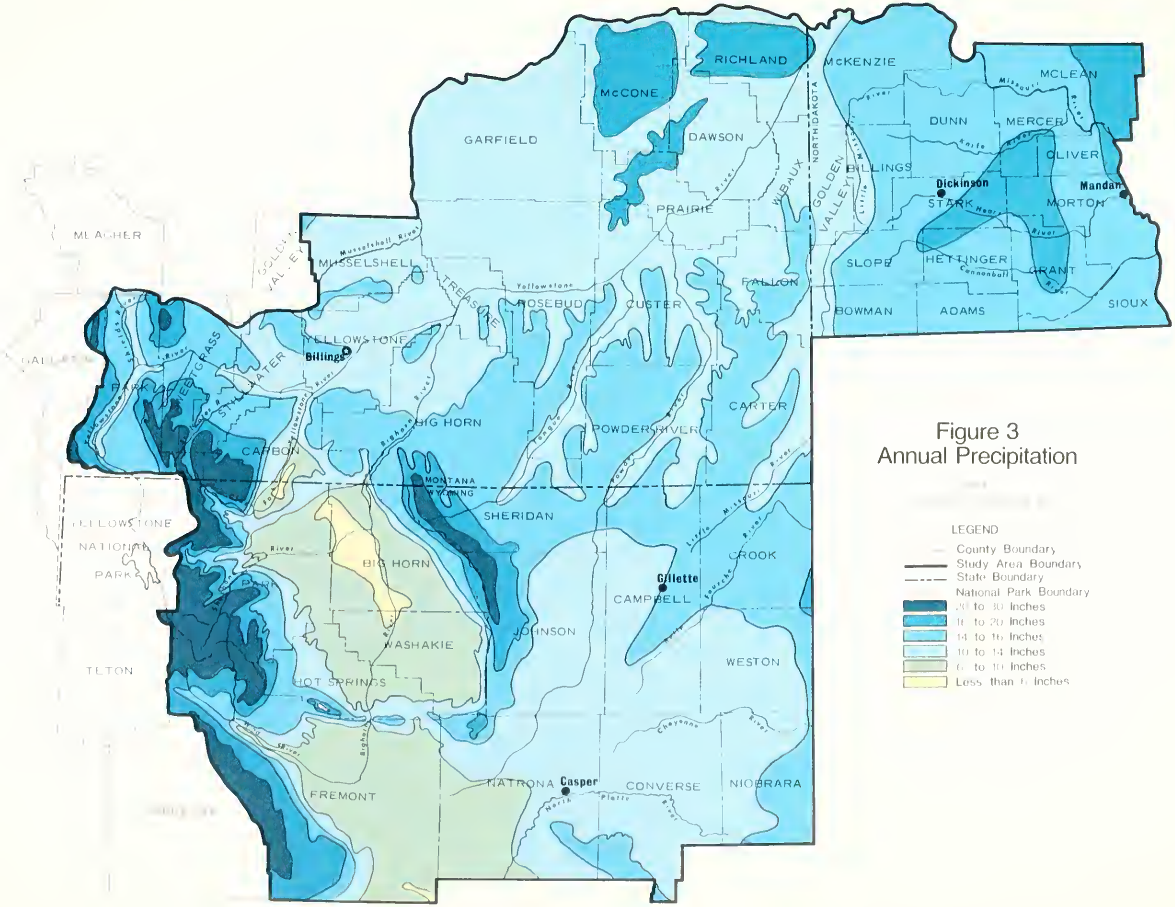


Figure 3
Annual Precipitation

Topography, Geology, and Land Resource Areas

Elevations in the study area range from a low of just over 1,500 feet on the Missouri River at the North Dakota-South Dakota State line to 13,785 feet at Gannet Peak in the Wind River Mountains in Wyoming.

Geologic materials in the study area range from ancient Precambrian igneous and metamorphic rocks to relatively recent volcanic and glacial deposits. The plains are underlain by flat-lying sedimentary shale and sandstone rocks of the Mesozoic and Cenozoic Age. The Fort Union Formation in eastern Montana and western North Dakota and its extension along with the Wasatch Formation in the Powder Basin of Wyoming account for the significant coal reserves. Typically, the flat-lying formations of the plains are upturned at the mountain flanks forming hogbacks and exposing geologic formations that are deeply buried beneath the plains. These rocks, especially Paleozoic limestones such as the Madison limestone, are potentially major aquifers and sources of industrial and agricultural water. Igneous and metamorphic rocks that form the core of many of the mountains also hold potential mineral wealth in the form of chromite and copper. Other geologic materials include a large area of volcanics in the Absaroka Mountains of Montana and Wyoming, small areas of glacial materials found along the extreme northern edge of the study area, and alluvial deposits that fill most of the major river valleys. Figure 4 shows the principal rock strata found in the study area. Not only is the composition of the geologic material significant to resource utilization, but so is its arrangement. The uplifted edges of the Madison limestone and other sedimentary strata form aquifer recharge areas. The warping of rocks by mountain-building forces resulted in basins and smaller folds which often became traps for oil and natural gas; such is the case in the Bighorn Basin and many mountain valleys.

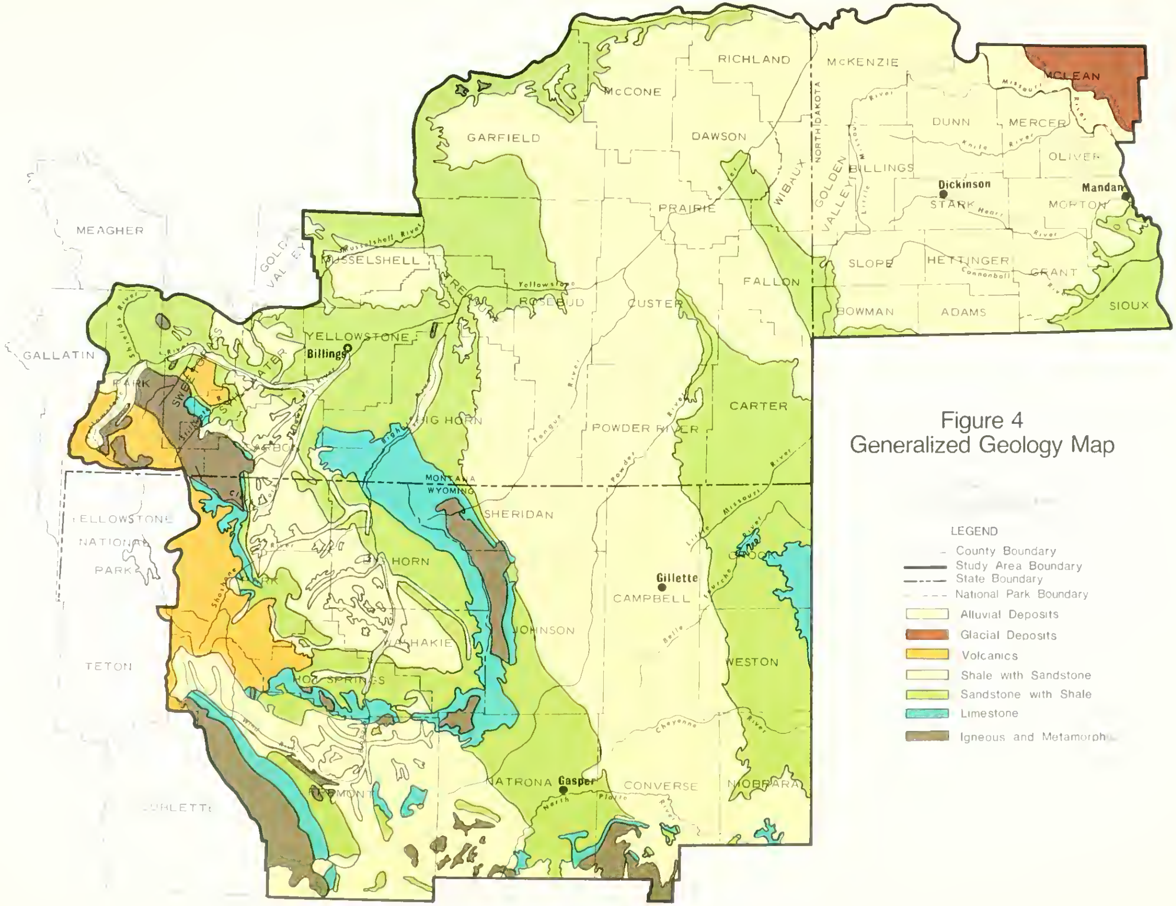


Figure 4
Generalized Geology Map

The action of climate over time on the exposed geologic materials in the study areas has created the landscape features evident today. Figure 5 outlines land resource areas which can be viewed in terms of general physiographic regions. Nearly 70 percent of the study area is within the Northern Great Plains Region. This is a region characterized by rolling plains which are unglaciated except in the extreme north and a few intervening areas of eroded badlands. The rest of the area is split about equally between the Rocky Mountain Region and the Desert Basin and Semiarid Mountain Region. The Rocky Mountain Region consists of rugged, high mountains extending well above timberline. The Desert Basin and Semiarid Mountain Region is a very dry area lying in the rain shadow of the Rocky Mountains. The Bighorn Basin and Owl Creek Mountains typify this region. Parts of two other regions just enter the study area in Wyoming. A small part of the Black Hills Region is located in northeastern Wyoming, and a part of the Central Great Plains Region is located in the extreme southeastern part of the area in Wyoming.

Soils

Soils in the study area fall into four categories: desert soils, weakly developed semiarid loamy and clayey soils, strongly developed semiarid loamy and clayey soils, and mountain soils. Mountain soils (Boralfs) are found exclusively in the Rocky Mountain Region, as shown on figure 5, and are useable primarily for forest land and rangeland. The desert soils (Orthents) are weakly developed soils that are dry most of the year and usable primarily for rangeland, although some are capable of supporting irrigated crops. These soils are found mainly in the Bighorn and Wind River Basins. Much of the Montana portion of the study area is composed of weakly developed loamy and clayey soils (Orthents) which receive more precipitation than those of the Bighorn Basin. These soils are used principally for rangeland with limited use for dry and irrigated crops. Strongly developed loamy and clayey soils are found mostly in North Dakota and the Powder River Basin. The soils in North Dakota (Borolls) are deep, fertile, and capable of supporting substantial dry and irrigated cropland. These soils extend westward from North Dakota into parts of Montana. Soils in the Powder River Basin (Argids), in contrast, are less fertile and receive less precipitation than those in North Dakota and are suitable primarily for rangeland.

Table 2 shows the acreage of soil-land capability classes.[1] Classes I through III are capable of supporting irrigated agriculture, while classes I through IV could be dry farmed.

[1] Land capability classes are groupings of soils according to the degree of hazards and limitations of use. The four major hazards and limitations are erosion, water problems, soil limitation, and climate. Hazards and limitations of use become progressively greater from class I to class VIII.

Table 2
SOIL-LAND CAPABILITY CLASS

Capability Class	Montana	N. Dakota	Wyoming	Study Area
	Thousand Acres			
I	108	5	26	139
II	1,117	3,818	347	5,282
III	1,477	2,640	914	5,031
IV	3,981	790	2,796	7,567
V	36	1	75	112
VI	12,292	2,804	7,446	22,542
VII	908	766	2,041	3,715
VIII	2,079	33	5,434	7,546
Subtotal	21,998	10,857	19,079	51,934
Nonclassified	10,306	3,115	13,605	27,026
Total	32,304	13,972	32,684	78,960

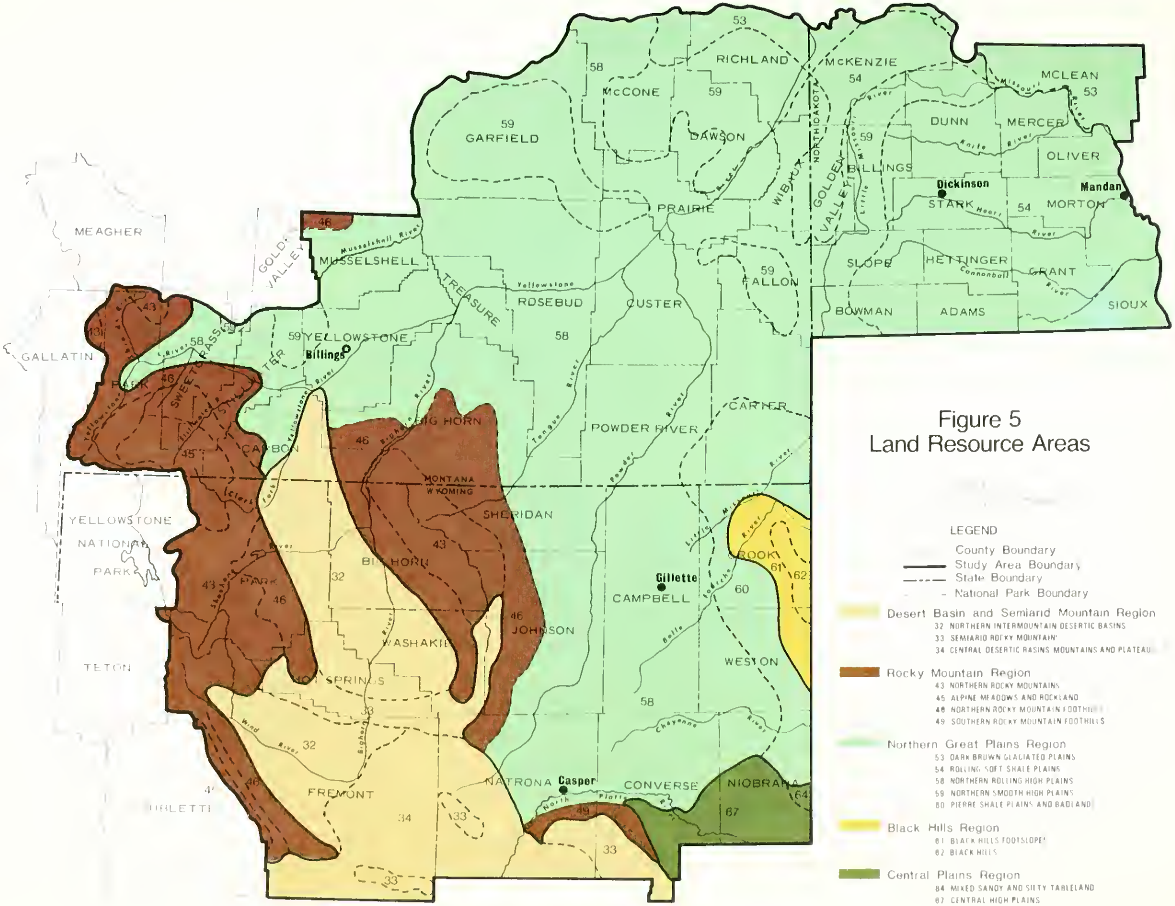


Figure 5
Land Resource Areas

Vegetation

Native vegetation in the study area is extremely varied, depending on range site. Shrubs tend to dominate the vegetative aspect in the lower precipitation zones. As precipitation becomes more plentiful with elevation, grasses and grasslike plants generally become more dominant. Along most of the major rivers and streams of the plains, flood plains are dominated by cottonwood and willow. Woodland vegetation, comprised of ponderosa pine and grasses, grow along the river breaks and sandstone buttes in the Bull Mountains and in Rosebud and Power River Counties, Mont. Isolated patches are found throughout the Great Plains. Forests of spruce, lodgepole, Douglas fir, and ponderosa pine cover most of the Rocky Mountains and Black Hills area, but give way to alpine grassland at timberline above 9,000 feet.

Some of the rangeland plant communities have been converted to agricultural crops. Likewise, many of the flood plain forests have been cleared for irrigated crops. With these exceptions, native vegetation in the study area is still common. The desert and semiarid grasslands have been grazed extensively by domestic livestock, as have most of the ponderosa pine woodlands and alpine areas. Livestock use has often been so excessive that vegetation damage and accelerated soil erosion have occurred.

Forests in the area are mostly slow growing and yield only limited supplies of timber.

Minerals

Minerals in the study area fall into three general categories: energy, metallic, and other. Energy minerals include coal, petroleum, natural gas, and uranium. Estimated recoverable coal reserves in the area are enormous, amounting to over 165 billion tons (table 3). These reserves consist mainly of subbituminous grade coal in Montana and Wyoming, and lignite in North Dakota. The largest coal deposits are found in the Powder River Basin of Montana and Wyoming (figure 6). Known oil and gas reserves are substantial in North Dakota, while in Wyoming and especially in Montana such reserves are declining rapidly. The presence of oil and gas has been associated traditionally with structural basins, such as the Bighorn

Table 3
COAL PRODUCTION AND ESTIMATED RECOVERABLE RESERVES—1975

	Montana	N. Dakota	Wyoming	Study Area
	Million Tons			
Production	21.8	7.7[a]	8.1	37.6
Reserves				
Subbituminous[b]	100,700	NA	44,000	144,700
Lignite	6,200	14,000	NA	20,600

a. Lignite production.
b. Includes a small percentage of bituminous coal.
Source: USDI, Bureau of Mines.

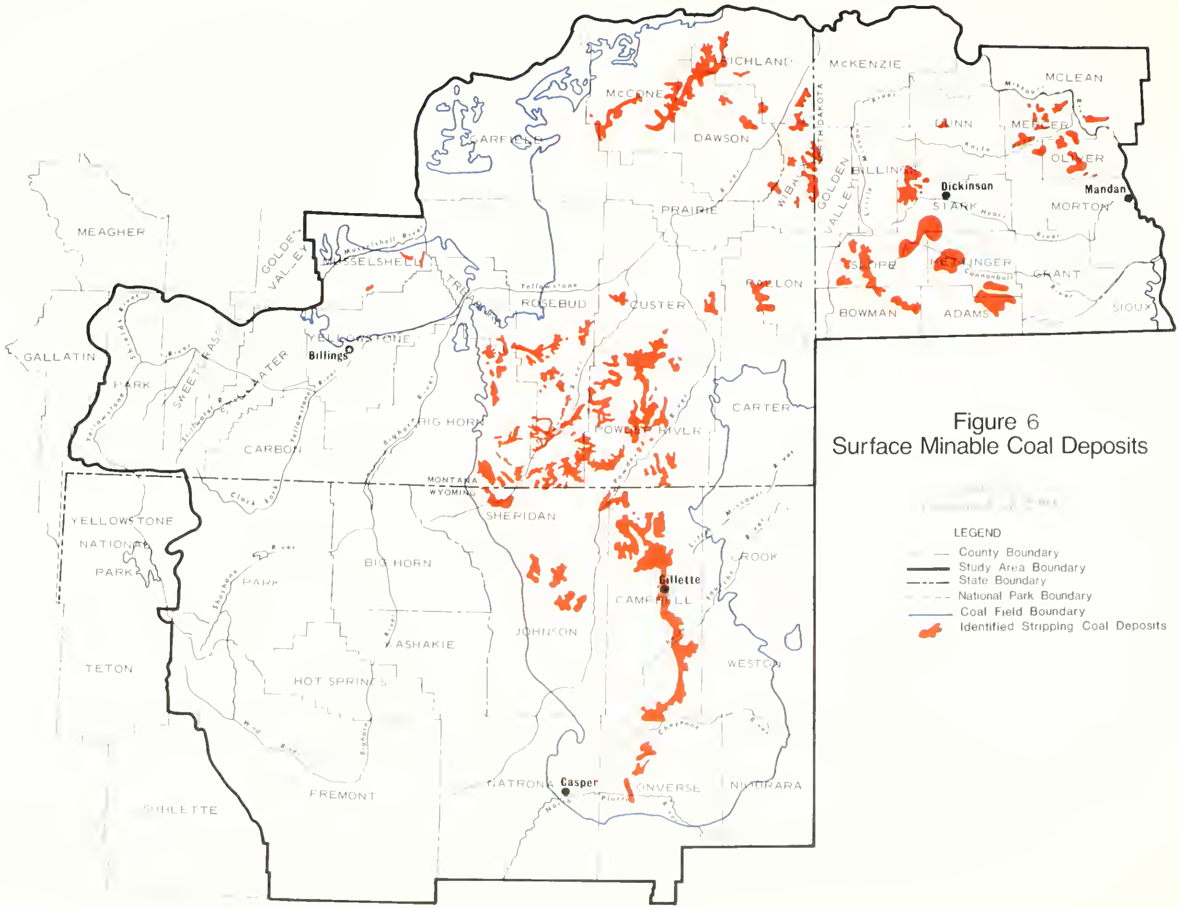


Figure 6
Surface Minable Coal Deposits

Table 4
URANIUM RESERVES—1975

Forward Costs[a]	Montana	N Dakota	Wyoming	Study Area
	Tons of U_3O_8			
$10	—	686	56,000	56,686
$15	10	919	122,000	122,929
$30	708	1,192	178,000	179,900
Total	718	2,797	356,000	359,515

a "Forward Costs" are those yet to be incurred at the time an estimate is made. Figures shown are dollars per pound These costs provide a means of estimating reserves and are independent of market prices

Basin, but exploration is increasing along the flanks of the Rocky Mountains. Uranium reserves are substantial only in Wyoming as shown in table 4.

Metallic mineral resources consist largely of chromate, copper, and iron ore. Chromate is found in the Stillwater Complex in Stillwater County, Mont. Copper is found near Meeteetse in Park County, Wyo., while iron ore occurs in southern Fremont County, Wyo. Iron ore is the only significant metallic mineral currently mined within the study area.

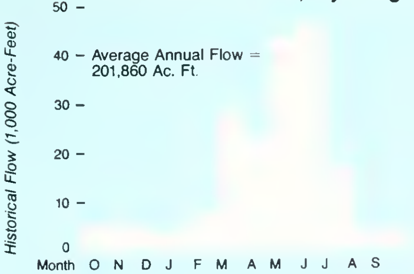
Other important minerals include bentonite, clay, sand and gravel, stone, lime, and gypsum. Bentonite and clay are associated with the shale deposits of the plains in all three States. Sand and gravel is found principally in the alluvium along stream channels, while stone is largely associated with localized rock outcrops or mountain areas. Lime and gypsum are derived from limestone outcrops that occur along the mountain flanks.

Water

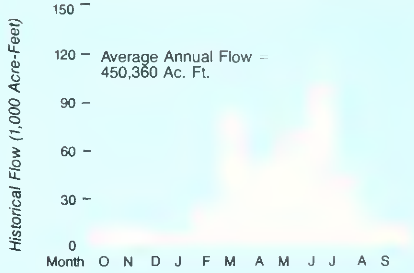
Streamflows in the study area originate primarily from melting snowpack in the higher mountains. Hydrographs of streamflow reflect the spring and early summer snowmelt, with high flows in June and July and very low flows during the winter months (figure 7). Low flows during August reflect not only lower natural streamflow but also higher rates of water diversions for irrigation. The snow hydrology along with the overall semiarid climate creates extreme seasonal flow variations, and annual variations resulting from periods of drought. For example, the average annual streamflow for the Tongue River at Miles City, Mont., is over 300,000 acre-feet, while the lowest recorded annual flow was less than 47,000 acre-feet and the maximum was over 1 million acre-feet. These seasonal and annual extremes in flow tend to intensify a variety of existing water problems.

Natural quality of streamflow is highly variable and is largely a function of geographic location.

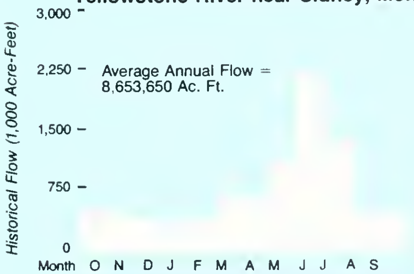
Powder River at Arvada, Wyoming



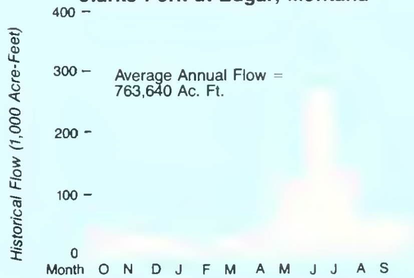
Powder River near Locate, Montana



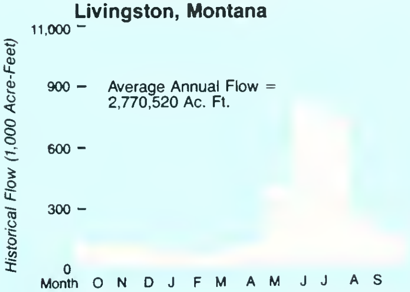
Yellowstone River near Sidney, Montana



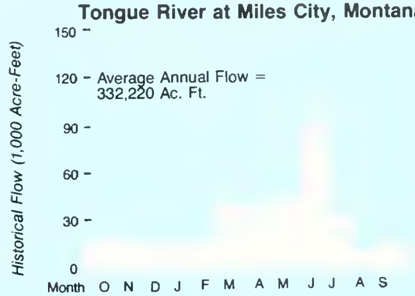
Clarks Fork at Edgar, Montana



Yellowstone River near Livingston, Montana



Tongue River at Miles City, Montana



Bighorn River near St. Xavier, Montana

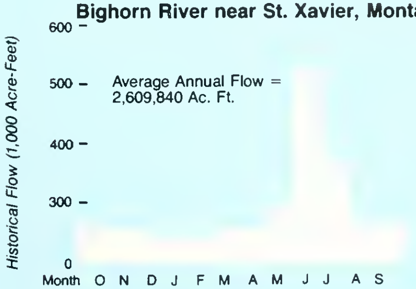


Figure 7
Monthly Flow of Selected Rivers in the Yellowstone River Basin

Table 5
SURFACE WATER QUALITY[a]

River Station	Mean Flow	Mean TDS[b]	Mean DO[c]	Mean BOD[d]
	cfs[e]	----------	Milligrams/Liter	----------
Yellowstone River Sidney, Mont	14,527	460	9.8	1.8
Bighorn River St. Xavier, Mont	4,000	622	11.4	1.7
Tongue River Miles City, Mont.	594	560	—	—
Powder River Moorhead, Mont.	642	1,522	9.0	3.0
Heart River Mandan, N. Dak	—	844	9.6	2.9

a. Based on limited data.
b. TDS Total Dissolved Solids
c. DO Dissolved Oxygen.
d. BOD = Biochemical Oxygen Demand.
e. cfs Cubic feet per second

Water quality is generally high within and adjacent to the mountains, but as streams flow across the sedimentary strata of the foothills and plains, water quality deteriorates. As can be seen in table 5, the main stem of the Yellowstone River generally has a higher quality water than any of its tributaries. Yellowstone River water quality remains quite high throughout its length, but it is gradually deteriorated by lower quality tributary inflows and human impacts downstream.

Ground water, like surface streamflow, originates largely from melting snow percolating through the soil and into aquifer formations lying near the surface. The main aquifers in the area are the relatively deep, buried ancient limestone and sandstone formations which are exposed only on the mountain flanks and the unconsolidated sands and gravels that fill most of the alluvial valleys (figure 4). Minor aquifers include the coal veins and sandstone layers of the Fort Union and Wasatch formations that immediately underlie most of the plains area.

Ground water quality is extremely variable, even over very short distances. Ground water quality is extremely variable, even over very short distances. Near-surface aquifers, like the Fort Union formation, generally hold water of fair quality—500 to 1,000 milligrams per liter of total dissolved solids—in quantities suitable for domestic purposes and in some places large enough for irrigation use. Generally, water with dissolved solids in excess of 500 milligrams per liter would have questionable value as a domestic water source under current criteria.

High quality water is obtainable from deep aquifers only near the outcrop area, such as along the flank of the Bighorn and Powder River Basins. The deeply buried aquifers, such as the Madison limestone, can yield exceptionally large quantities—1,000 to 3,000 gallons per minute—of high quality water containing about 250 milligrams per liter of total dissolved solids. Both quantity and quality of the water from these aquifers vary widely from location to location, however. Although ground water is prevalent in some locales, a substantial portion of the study area does not have readily available supplies of potable ground water. Areas on the high plains of Montana and North Dakota and in the center of the Bighorn and Powder River Basins have especially difficult problems producing suitable water supplies.

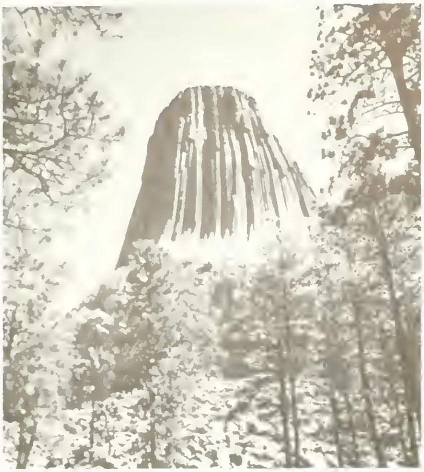
Fish and Wildlife

Wildlife has been more affected by the presence of man than any other resource in the study area. This impact is recognized principally in the replacement of the plains bison by domestic livestock. Such impacts also extend to the relocation of other animals, such as elk, and the introduction of new species, such as pheasants. Terrestrial wildlife can be divided into two general groups—plains species and mountain species. Plains species include whitetail and mule deer, pronghorn antelope, sage and sharptailed grouse, prairie dogs, numerous furbearers, raptorial birds, migratory waterfowl, and introduced species such as pheasants, partridge and turkey. Mountain species include whitetail and mule deer, elk, moose, bighorn sheep, mountain goat, black and grizzly bear, mountain grouse, and numerous furbearers and raptorial birds. Endangered species include the northern rocky mountain wolf, the peregrine falcon, the black-footed ferret, and an occasional migrating whooping crane. The grizzly bear is listed as threatened within the area.

Fisheries and other aquatic wildlife consist of sport, commercial and other fish, amphibians, reptiles, and mollusks. Sport fish include cold-water salmonoid fish, such as trout and whitefish found in most mountain streams and the Upper Yellowstone River, and warm water fish, such as sauger, channel catfish, ling, and paddlefish found in the Lower Yellowstone River and other plains rivers. Commercial fisheries exist only on the periphery of the study area in Fort Peck Reservoir and Lake Sakakawea on the Missouri River, though opportunities for developing commercial fisheries are available on a number of large reservoirs within the study area. There are well over 50 different species of fish in the study area that are not now utilized by man, but which nevertheless have important intrinsic and ecological values. Little information is available on the occurrence, ecological importance, or potential values of these fish and other amphibians, reptiles, and mollusks. No fish, amphibians, reptiles, or mollusks are currently listed as threatened or endangered.

Significant Landscape Features

Unique and nationally significant natural landscape features are found throughout. These features include badland, geologic and hydrologic features, alpine lakes, unique vegetation, and productive streams. Badlands are found throughout the plains adjoining many of the major



streams. Outstanding examples are found along the Little Missouri River and near Glendive, Mont. Parts of these areas are included in Theodore Roosevelt National Memorial Park, N. Dak., and Makoshika State Park, Mont. Unique geologic and hydrologic features include: spectacular canyons such as found along the upper Clarks Fork and Tongue Rivers in Wyoming and the Wind River and Bighorn Canyons on the Bighorn River, geologic formations such as Devils Tower National Monument in northeastern Wyoming, and spectacular waters such as Boulder Falls on the Boulder River in Montana and Shell Falls on Shell Creek in Wyoming. Alpine lakes and alpine tundra are found extensively on the Beartooth Plateau and in smaller areas of many of the other mountain ranges. Unique vegetation is associated with a few small areas of pristine prairie and isolated stands of limber pine and columnar juniper in North Dakota. The main stem of the Yellowstone River above Big Timber, Mont., is recognized as a premium trout fishery of national importance.

Land Ownership and Administration

The general pattern of surface ownership in the study area is shown in figure 8. Table 6 gives a breakdown of Federal and non-Federal ownership for each State and planning area.

Table 6
SURFACE OWNERSHIP BY PLANNING AREA

State and Planning Area	Federal	Non-Federal	Total
	Acres		
Montana			
Upper Yellowstone	1,475,299	4,462,028	5,937,327
Clarks Fork-Bighorn	597,122	2,870,438	3,467,560
Tongue-Powder	1,254,894	4,010,698	5,265,592
Lower Yellowstone	3,172,167	14,461,129	17,633,296
Subtotal	(6,499,482)	(25,804,293)	(32,303,775)
North Dakota			
North Dakota Tributaries	1,588,881	12,382,959	13,971,840
Wyoming			
Wind-Bighorn-Clarks Fork	9,299,013	5,307,417	14,606,430
Northeast Wyoming	3,573,613	14,503,987	18,077,600
Subtotal	(12,872,626)	(19,811,404)	(32,684,030)
Total Ownership	20,960,989	57,998,656	78,959,645

Source Level B Land Use Ad Hoc Report

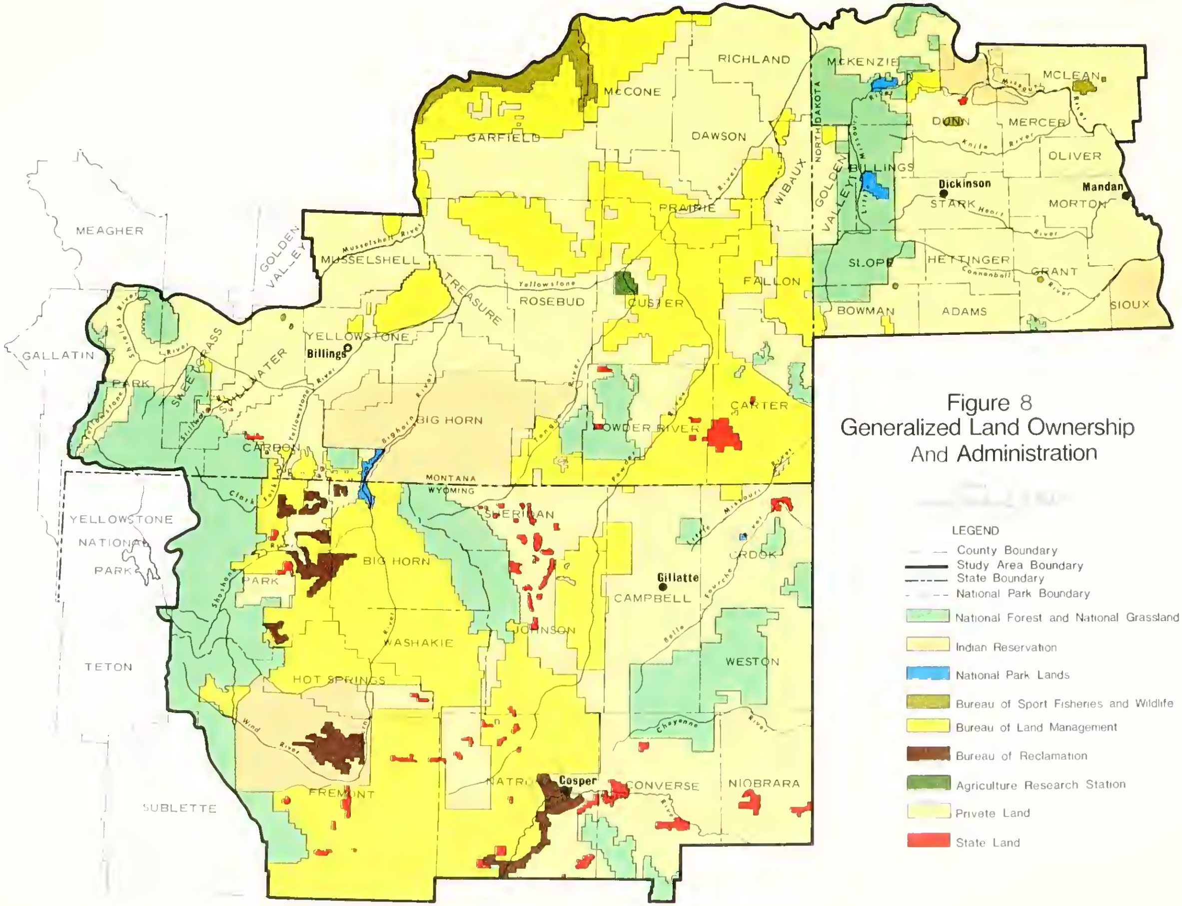


Figure 8
Generalized Land Ownership
And Administration

About 27 percent of the study area is Federal land administered by agencies of the Federal Government. The two largest Federal land administrative agencies are the Bureau of Land Management and the Forest Service. The remaining 73 percent of the area is in non-Federal ownership. This includes the privately owned lands, those lands owned by Indians but held in trust by the U.S. Government, and those lands owned by State, county, and municipal governments.

Table 7
LAND USE AND COVER

Land Use-Cover Category	Montana	N. Dakota	Wyoming	Study Area	Percent
	Acres				
Cropland					
Irrigated	609,776	91,566	599,384	1,300,726	2
Nonirrigated	2,877,000	5,505,509	529,040	8,911,549	11
Pasture					
Irrigated	124,869	1,490	213,000	339,359	1
Nonirrigated	552,830	311,680	138,410	1,002,920	1
Range	23,911,055	7,087,975	25,812,735	56,811,765	72
Forest Land					
Commercial	761,500	0	2,214,000	2,975,500	4
Noncommercial	2,488,340	189,250	1,342,180	4,019,770	5
Urban & Builtup	206,000	170,620	131,015	507,635	1
Barren Land and Tundra	351,400	204,700	1,482,000	2,038,100	2
Water	421,015	409,050	222,266	1,052,331	1
Total	32,303,785	13,971,840	32,684,030	78,959,655	100

Resource Utilization

Agriculture and Forestry

Agriculture is the largest land use in the study area, amounting to over 85 percent of the total (table 7). Over 70 percent of all land is used for range, followed by dryland farming, which uses over 10 percent. A comparison of the irrigated and dry cropland in table 7 with the acreage of land suitable for crop production, classes I through IV in table 2, shows that an additional acreage could be cultivated. This does not imply, however, that all land presently cropped is suitable for such use. Some recent cropland expansion has been noted to occur on soils unsuited for such use. Although almost all range is grazed and some areas are very well managed, a significant portion needs improved management practices or mechanical improvements. About 90 percent of all water use in the basin is attributable to agriculture.

Forestry use is extremely limited due to slow tree growth on most forest land. This situation results from natural conditions, such as high elevation, short growing season, and limited moisture, as well as from a lack of management necessary to convert the large expanses of overmature, stagnated, and overstocked timber stands to healthier and faster growing stands.

Table 8
AVERAGE ANNUAL VALUE OF MINERAL PRODUCTION
1960 Through 1974

Mineral	Montana	N. Dakota	Wyoming	Study Area
	Thousand Dollars[a]			
Coal	6,963	5,972	8,334	21,269
Petroleum	68,496	25,334	348,036	441,866
Natural Gas[b]	1,243	1,787	17,515	20,545
Natural Gas Liquids[c]	NA	NA	10,768	10,768
Uranium[d]	—	—	35,693	35,693
Energy Minerals Subtotal[e]	76,702	33,093	420,346	530,141
Bentonite	NA	NA	14,964	14,964
Iron Ore	—	—	14,542	14,542
Sand & Gravel	3,780	1,209	3,344	8,333
Other Nonenergy Minerals	3,162[e]	272[e]	589	4,023
Nonenergy Minerals Subtotal	6,942	1,481	33,439	41,862
Total Mineral Production[d]	83,080	35,393	451,656	570,129

a/ 1967 dollars, except as noted
b/ 1961-1974 average.
c/ 1960-1972 average
d/ Columns may not total precisely due to nonreporting of some data
e/ May include some bentonite production

Mineral Production

Next to agriculture, mineral production is the largest economic use of land in the study area, although the actual acreage of land use is quite small. Table 8 lists the types and average values of mineral production since 1960. Oil production has been the most important single mineral, accounting for over 70 percent of the total mineral value in all three States. These historical values are somewhat misleading in that recent increases in coal production are not adequately reflected. Estimated 1975 value for coal production should approach $175 million. Coal is now the second most important mineral produced in the study area and is becoming relatively more important as petroleum production remains constant or even declines. Uranium, which traditionally has been the second most important mineral, continues to be important. Uranium production is expected to increase, but at a slower rate than coal. Production of nonenergy minerals has generally been declining in recent years because of a lower demand for sand, gravel, and stone. The production of sand, gravel, and stone is dependent on large construction projects such as the Interstate Highway System. Iron ore and bentonite are produced primarily in Wyoming, and production has increased slowly, but steadily, since l960. Expanding mineral production will have severe impacts on other land uses until these lands are adequately reclaimed.

Table 9
OUTDOOR RECREATION RESOURCES BY TYPE

Recreation Type	Montana	N. Dakota	Wyoming	Study Area
TYPE I - Historic, Scenic & Natural				
No. of Areas	628	30	45	703
Land Acres	188,008	82,584	NA	270,592
Water Acres	0	0	NA	0
Total Acres	188,008	82,584	NA	270,592
Trail Miles	128	NA	NA	128
TYPE II - Land-Oriented Recreation				
No. of Areas	23	841[a]	579[a]	1,543[a]
Land Acres	2,104,393	1,213,100[a]	18,387,845[a]	21,705,338[a]
Water Acres	NA	5,914	11,581	17,495
Total Acres	2,104,393	1,219,014[a]	18,399,416[a]	21,722,833[a]
TYPE III - Water-Oriented Recreation				
No. of Areas	67	121	93	281
Land Acres	4,993	29,170	130,642	164,805
Water Acres	826	288,759	92,327	381,912
Total Acres	5,819	317,929	222,969	546,717
Stream Miles	2,700	572	6,834	10,106

a. Includes rest areas

Outdoor Recreation

Outdoor recreation resource use is highly dependent on natural landscape features and manmade opportunities. Although no land is specifically identified for recreation use in table 7, a large portion of the noncommercial forest, barren and tundra, range and water acreage is available for recreation. Table 9 summarizes the number of areas and acreages devoted to recreation in the study area.

Table 10 summarizes selected wateroriented recreation resources (type III). Although the acreages in tables 9 and 10 appear large, not all of these areas are devoted exclusively to recreation. The existence of large tracts of Federal lands provides substantial opportunities for dispersed recreational pursuits.

Significant outdoor recreational opportunities in the study area consist of abundant big game in the mountains, trout in the Upper Yellowstone River and paddlefish in the Lower Yellowstone, impressive mountain scenery in the Beartooth Plateau, and extensive wilderness in the Absaroka and Wind River Mountains. The study area is also nationally important as a route to Yellowstone and Grand Teton National Parks and provides numerous tourist facilities for vacationers. Archaeological and historical sites are relatively numerous, consisting of early Indian settlement and cultural sites, historic trails, battlefields, and forts. However, only a few of these sites, such as the Custer Battlefield, are developed. Other developed recreation sites include Theodore Roosevelt National Memorial Park, Devils Tower National Monument, Bighorn Canyon National Recreation Area, camping facilities in the national forests and at most major reservoirs, and a number of State parks.

Table 10
SELECTED WATER-ORIENTED RECREATION RESOURCES

Land Classification	Montana	N. Dakota	Wyoming	Study Area
Local Parks Inc.—Those at Federal Reservoirs				
No. of Areas	2	25	0	27
Land Acres	11	6,252	0	6,263
Water Acres	0	3,408	0	3,408
Total Acres	11	9,660	0	9,671
State Parks & Recreation Areas				
No. of Areas	8	3	3	14
Land Acres	3,181	2,139	25,300	30,620
Water Acres	826	10	35,700	36,536
Total Acres	4,007	2,149	61,000	67,156
State Fishing & Hunting Areas				
No. of Areas	20	16	NA	36
Land Acres	986	5,072	NA	6,058
Water Acres	NA	1,392	19,902	21,294
Total Acres	986	6,464	19,902	27,352
National Wildlife Refuges & Fish Hatcheries				
No. of Areas	NA	4	1	5
Land Acres	NA	10,528	5	10,533
Water Acres	NA	1,612	NA	1,612
Total Acres	NA	12,140	5	12,145
Indian Reservations				
No. of Areas	3	2	1	6
Land Acres	NA	420	NA	420
Water Acres	NA	0	NA	NA
Total Acres	NA	420	NA	420
Federal Reservoirs				
No. of Areas	4	21	3	28
Land Acres	740	2,904	105,337	108,981
Water Acres	NA	268,023	17,286	285,309
Total Acres	740	270,927	122,623	394,290
Private Lands				
No. of Areas	12	48	85	145
Land Acres	75	1,595	NA	1,670
Water Acres	NA	2,143	19,439	21,582
Total Acres	75	3,738	19,439	23,252
Streams & Stream Systems				
No. of Areas	18	2	NA	20
Land Acres	NA	260	NA	260
Water Acres	NA	12,171	NA	12,171
Total Acres	NA	12,431	NA	12,431
Total Stream Miles	2,600	572	6,834	10,006

Source: U.S.D.I. Heritage Conservation and Recreation Service

Table 11
WATER STORAGE FACILITIES GREATER THAN
5,000 ACRE-FEET

Facility Name	Planning Area	Stream Location	Primary Purpose[a]	Storage Capacity Acre-Feet
Boysen	Bighorn, Wyoming	Wind-Bighorn River	Multiple Use	922,600
Brooks Lake	Bighorn, Wyoming	Wind River	M&I	9,700
Louis Lake	Bighorn, Wyoming	L. Popo Agie R	P	8,000
Shoshone	Bighorn, Wyoming	Shoshone Cr.	I	9,700
Yellowtail Reservoir	Bighorn, Montana	Bighorn River	Multiple Use	1,375,000
Tongue River	Tongue, Montana	Tongue River	I	69,439
Cooney	Clarks Fork, Montana	Red Lodge Cr	I	24,190
Willow Creek	Bighorn, Montana	Lodge Grass Cr.	I	23,000
Mystic Lake	Upper Yellowstone, Montana	West Rosebud Cr	P	20,800
Lake Walvoord	Upper Yellowstone, Montana	Sweet Grass Cr.	I	14,000
Lake Adam	Upper Yellowstone, Montana	Sweet Grass Cr.	I	11,000
Heart Butte	Western Tribs, North Dakota	Heart River	Multiple Use	75,800
Bowman-Haley	Western Tribs, North Dakota	Grand River	Multiple Use	21,950
Nelson Lake	Western Tribs., North Dakota	Square Butte Cr.	P	10,400
Lake Ilo	Western Tribs., North Dakota	Spring Cr.	FWL, R	7,130
Dickson	Western Tribs., North Dakota	Heart River	I, M&I, FC	6,680
Buffalo Bill	Bighorn, Wyoming	Shoshone River	I, Ind., D, M&I	421,300
Lake DeSmet	Powder, Wyoming	Piney Cr.	I, Ind.	239,243
Keyhole	Western Tribs., North Dakota	Belle Fourche River	Multiple Use	190,000
Bull Lake	Bighorn, Wyoming	Bull Lake Cr.	I, Ind.	152,500
Lower Sunshine	Bighorn, Wyoming	Greybull River	Multiple Use	56,800
Upper Sunshine	Bighorn, Wyoming	Greybull River	Multiple Use	53,000
Pilot Butte	Bighorn, Wyoming	Wind River	I, P, M&I	36,900
Anchor	Bighorn, Wyoming	S. Fork Owl Cr.	I, D	17,400
Big Goose Park	Tongue, Wyoming	Big Goose Cr.	Multiple Use	11,200

a I = Irrigation; P = Power; FWL = Fish & Wildlife; R = Recreation; M&I = Municipal & Industrial; FC = Flood Control; D = Domestic; Ind = Industrial.
Source: State Agency Reports

Water Utilization

About one-third of the major rivers in the area have some form of reservoir storage on them. Table 11 lists those storage facilities larger than 5,000 acre-feet. Most of these facilities were constructed primarily for irrigation or municipal and industrial water storage or for power generation. Most are maintained and operated for multiple uses. Although a large portion of the major tributaries of the Yellowstone River do not have storage facilities, extensive use of water for irrigation is made through onstream diversions or pumps. Actual consumption of water is about 10 percent of total streamflow of the Yellowstone River at Sidney, Mont., but the amount of water that is diverted from streams has significant impacts on instream flows and water quality locally. In addition to water consumption, instream use of water for recreation and water quality maintenance is beginning to be recognized as an important and beneficial water use.

Man's use of surface water is directly evident in the form of water quality impacts arising from both depleted flows and pollutants. Water quality problems occur throughout the study area, but are most prevalent in the Bighorn and Powder River Basins. Major problems are associated with inadequate sewage treatment, return flows high in nutrients, large natural highly mineralized springs, and pollution from petroleum production. Natural

process sediment is the most visible problem in all of the major Yellowstone tributaries and is largely the result of natural erosion processes. Even so, land disturbances by man, especially from mining and agriculture, have resulted in accelerated erosion. Water quality problems are not confined to the plains. Acid-mine drainage from past hard-rock mining in the headwaters of some mountain streams is an isolated but continual source of pollution. Water quality will become an increasingly important consideration in future flow depletion decisions.

Ground water is relatively limited in the study area and occurs most often in the valley alluvium. The largest single use of ground water traditionally has been for domestic and livestock use. Large amounts of ground water have also been used in oil field injection to increase well yields. Ground water use for irrigation and for coal mining and processing is increasing. Current use of ground water has resulted in few changes in either the quality or quantity of this resource. As the use of ground water increases, water levels in wells may continue to drop. Lowering of the ground water level could, in time, affect streamflows in the recharge area of the impacted aquifer. Coal mining activity that overturns or replaces the material overlying some aquifers may degrade ground water quality. Mining within an aquifer could cause a lowering of water levels in that aquifer and affect adjacent wells, springs, and streams.

CHAPTER 3

SOCIOECONOMIC CHARACTERISTICS

Population

Study area population in 1975 was slightly over 500,000, a 10 percent increase from 1970 (table 12). The Northeast Wyoming and Upper Yellowstone, Mont., planning areas each represent about one-fourth of the study area's current population. These two areas contain the major urban centers—Casper, Wyo., and Billings, Mont. The growth in study area population between 1970 and 1975 represents a reversal of the 1960 to 1970 downward trend. The reversal was due to energy development and a healthier agricultural sector.

The number of persons living on farms has been decreasing areawide. The percentage of the population residing on farms in 1970 varied considerably among the planning areas. Almost 35 percent of the North Dakota Tributaries' residents lived on farms, whereas less than 8 percent of the population lived on farms in the Upper Yellowstone planning area of Montana. The presence of Billings in the Upper Yellowstone area is the major reason the area's percentage of farm residents is so low.

The 1970 median age of study area residents was 28.0 compared to 28.3 nationally. The study area contains a higher percentage of people under 18 years (37.6) than the Nation (34.3). The median age and age distribution did not vary a great deal among the seven planning areas.

Table 12
POPULATION ESTIMATES FOR STUDY AREA

Category/Area	1960	1970	1975
Study Area	466,595	456,612	502,784
Upper Yellowstone	(100,992)	(105,984)	(117,700)
Clarks Fork-Bighorn	(18,324)	(17,153)	(18,600)
Tongue-Powder	(15,712)	(15,060)	(14,300)
Lower Yellowstone	(51,046)	(44,886)	(48,578)
North Dakota Tributaries	(107,649)	(97,241)	(97,969)
Wind-Bighorn-Clarks Fork	(70,188)	(68,774)	(75,623)
Northeast Wyoming	(102,684)	(107,514)	(130,014)
3 States	1,637,279	1,644,617	1,759,000
% of 3 States	28.5	27.8	28.6
% Urban	46.2	50.7	NA
% Farm	23.0	18.1	NA
% Rural Nonfarm	30.8	31.2	NA

Source: Level B current and projected population income and earnings ad hoc report.

Table 13
YEARS OF SCHOOL COMPLETED BY
PERSONS 25 YEARS OF AGE AND OLDER—1970

Education Level	Study Area		United States
	Number	Percent	Percent
Elementary			
0 to 8 years	25,271	10.5	15.5
8 years	45,091	18.6	12.7
High School			
Less than 4 years	36,148	14.9	19.4
4 years	78,704	32.5	31.1
College			
Less than 4 years	34,025	14.1	10.6
4 years or more	22,677	9.4	10.7

Education

Educational attainment by the area's people compares very favorably with the Nation (table 13). A higher percentage of the area's residents have some college education than do all the Nation's residents, and a smaller percentage have less than an 8th-grade education. For an area that is more rural than the Nation as a whole, such comparisons speak well of the educational resources.

People in urban areas generally have attained higher levels of education than those in the rural areas so planning areas such as the North Dakota Tributaries that are the most rural had the lowest levels of formal education.

Income

The 1970 average family income in the area was almost $9,400, which was about 15 percent lower than the national average. Average family incomes varied considerably among study areas from a high of $10,878 in Northeast Wyoming to a low of $8,084 in the North Dakota portion of the area. In Northeast Wyoming the average exceeded the national average by about 1 percent. The distribution of the income (figure 9) was not too much different than the Nation's; however, there were relatively fewer study area families making $10,000 or more when compared to the U.S. The income distribution in Northeast Wyoming was practically identical to the U.S. whereas the North Dakota and Clarks Fork-Bighorn, Mont., areas' incomes were more heavily distributed to the lower incomes than the Nation or any of the other planning areas.

Per capita income in the study area in 1974 (adjusted to 1975 dollars) was about $5,400, compared to a national average of almost $5,800. The Clarks Fork-Bighorn, Mont., planning area's personal income was $4,200, only 71 percent of the national average, whereas Northeast Wyoming's per capita income was a little higher than the Nation's.

Figure 9
Family Income Distribution

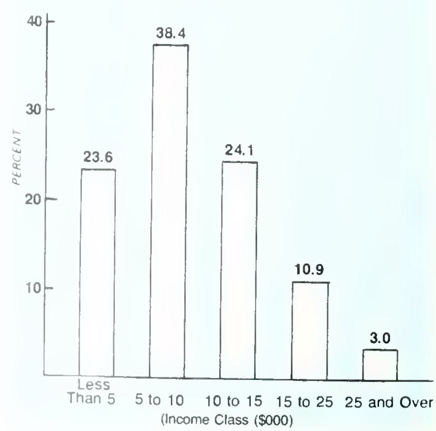
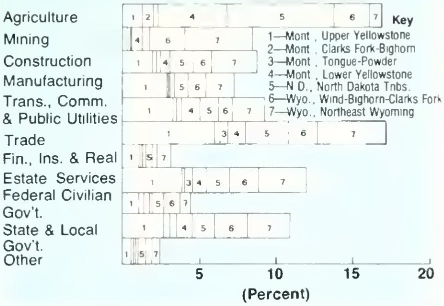


Figure 10
Percent of Earnings By Source—1974



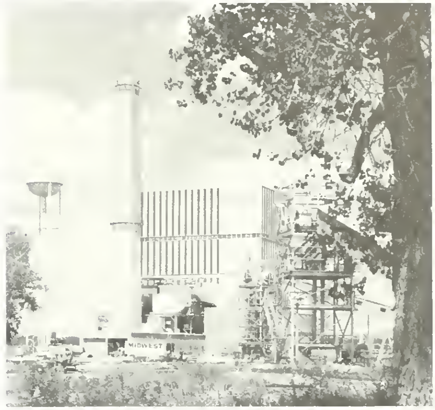
Earnings

Agriculture, including forestry, is the base industry that contributes the most to primary earnings in the study area (figure 10). Agriculture is a much more important contributor to earnings in the area (16.8 percent) than the Nation (3.7 percent). The relative contribution of individual planning areas to total output of each sector is depicted by the size of the numbered areas in each bar of figure 10. For example, area 5 contributed the most to agricultural earnings of the study area, whereas planning area 7 was the most important contributor to earnings for the mining sector. One cannot determine from this figure, however, the percentage contribution of a given sector in a specific planning area.

To determine the relative importance of sectors for each planning area, one must refer back to the individual planning area reports. In those reports one will find, for example, that in Northeast Wyoming agriculture contributes only 3.4 percent of total earnings, whereas in the Lower Yellowstone area of Montana it accounts for almost 41 percent of the total earnings.

Mining, including oil and gas, is also more important to the area than it is to the Nation. Over 8 percent of the area's earnings are due to mining compared to only a little over 1 percent nationwide. Almost 18 percent of Northeast Wyoming's earnings were due to mining, whereas only about 1.3 percent of the Upper Yellowstone, Mont., earnings came directly from mining. Manufacturing, which is nationally by far the most important sector in terms of earnings, ranks eighth in the study area.

Wholesale and retail trade generates the most earnings of all sectors. Trade, however, depends heavily on base sectors such as agriculture and mining for its sales. The importance of trade in terms of total earnings varies considerably, from about 10 percent in the Lower Yellowstone, Mont., to almost 24 percent in the Upper Yellowstone, Mont. The Upper Yellowstone area is high due to the wholesale-retail trade center at Billings.



Employment

Ranking sectors by employment provides ranks similar to those that resulted from ranking sectors by earnings. Farm employment when combined with farm proprietors accounts for almost 15 percent of the area's total employment (figure 11). It is not possible to compare other sectors to agricul-

Figure 11
Percent Employment by Source — 1974

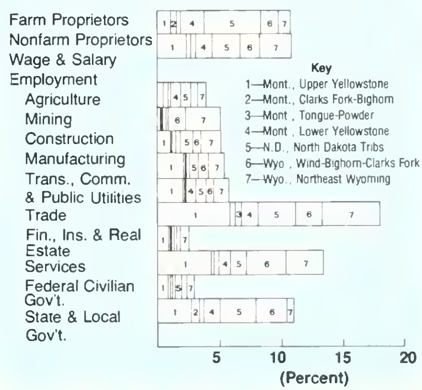


Table 14
UNEMPLOYMENT RATES

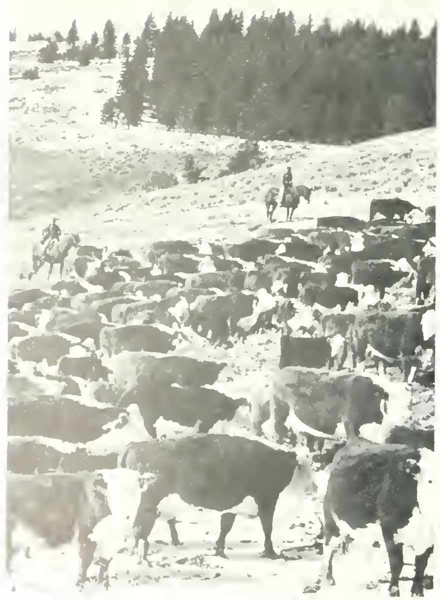
Area	1972	1973	1974	1975
	Percent			
Upper Yellowstone	5.8	5.4	5.4	6.9
Clarks Fork-Bighorn	7.9	7.5	8.3	8.5
Tongue-Powder	5.0	4.6	4.1	5.0
Lower Yellowstone	4.3	4.2	4.2	4.7
North Dakota Tributaries	6.3	6.6	6.1	5.8
Northeast Wyoming	3.8	3.1	3.2	3.5
Wind-Bighorn-Clarks Fork	4.4	3.8	3.8	4.7
State Parts of Study Area				
Montana	5.5	5.2	5.2	8.1
North Dakota	4.9	5.1	5.0	4.9
Wyoming	3.8	3.3	3.4	4.2
State of				
Montana	6.1	6.2	6.7	8.1
North Dakota	4.9	5.1	5.0	4.9
Wyoming	3.8	3.3	3.4	4.2
United States	5.6	4.9	5.6	8.5
Study Area	5.1	4.8	4.8	5.3

ture since nonfarm proprietors are not distributed over the nonfarm sectors. Trade, however, is the most important individual sector, providing 18 percent of the area's jobs. State and local government provides jobs for almost 11 percent of the area employment which makes it an important sector.

Study area unemployment for the past four years has tended to be lower than the national average (table 14). The highest unemployment rates within the study area occur in the Clarks Fork-Bighorn area of Montana and in the North Dakota Tributaries area. Northeast Wyoming has had the lowest unemployment rate of the 7 planning areas. The study area's unemployment has consistently been below that of the State of Montana, higher than the State of Wyoming, and about the same as the State of North Dakota (table 14).

Agricultural Sales

Livestock traditionally has been the largest contributor to agricultural sales in the study area. The latter is also generally true of all seven planning areas except for North Dakota, where crops have in some years contributed as much or more than livestock to total agricultural sales.



Agricultural sales almost doubled between 1969 and 1974 (table 15). Part of the increase was due to increased production, but a large part was due to increased prices. The year 1974 was a very favorable year for agricultural prices, especially crops. Since that time, agricultural commodity prices have fallen severely so that similar figures for today are likely to be lower than in 1974.

Production expenses continue to go up (table 15). As a value these expenses accrue primarily to the support of other businesses. Like all expenses, without these expenditures by the agricultural sector many of the other businesses would not exist.

Average farm size continued to increase in the early 1970's in the study area. The largest farms in terms of acres occur in the Northeast Wyoming and Tongue-Powder, Mont., planning areas. Farms in these areas tend to be less intensively used compared to other areas. Much of the land in the designated areas is grazed by livestock, and relatively little is farmed. The total acreage farmed was about the same in 1974 as it was in 1959.

Table 15
FARM SIZE, VALUE OF PRODUCTION, AND FARM EXPENSES

Category/Area	1959	1964	1969	1974
Land in Farms (1,000 Acres)	50,901	52,594	51,540	50,831
No. of Farms	24,509	22,379	21,715	19,929
Ave. Size of Farms (Ac.)	2,077	2,350	2,373	2,551
Upper Yellowstone	(1,757)	(1,845)	(1,851)	(1,780)
Clarks Fork-Bighorn	(2,695)	(2,305)	(2,861)	(2,889)
Tongue-Powder	(5,232)	(5,742)	(5,325)	(5,099)
Lower Yellowstone	(2,986)	(3,557)	(3,408)	(3,529)
North Dakota Tributaries	(1,073)	(1,311)	(1,320)	(1,360)
Wind-Bighorn-Clarks Fork	(1,843)	(2,242)	(2,340)	(2,400)
Northeast Wyoming	(4,856)	(5,145)	(4,951)	(5,221)
Total Value of Ag. Products Sold ($000)	273,806	293,599	454,344	834,630
% Sales from Crops—Study Area Total	27.8	36.0	28.7	47.0
Upper Yellowstone	(30.3)	(27.8)	(17.0)	(32.0)
Clarks Fork-Bighorn	(34.4)	(39.3)	(28.4)	(41.4)
Tongue-Powder	(16.3)	(17.0)	(14.0)	(29.2)
Lower Yellowstone	(29.8)	(38.3)	(31.9)	(53.9)
North Dakota Tributaries	(34.8)	(49.4)	(43.9)	(60.0)
Wind-Bighorn-Clarks Fork	(29.3)	(32.6)	(29.1)	(47.4)
Northeast Wyoming	(7.0)	(9.4)	(5.2)	(12.1)
% Sales from Livestock-Study Area	72.2	64.0	71.3	53.0
Upper Yellowstone	(69.7)	(72.2)	(83.0)	(68.0)
Clarks Fork-Bighorn	(65.6)	(60.7)	(71.6)	(58.6)
Tongue-Powder	(83.7)	(83.0)	(86.0)	(70.7)
Lower Yellowstone	(70.2)	(61.6)	(68.1)	(46.1)
North Dakota Tributaries	(65.2)	(50.6)	(56.1)	(40.0)
Wind-Bighorn-Clarks Fork	(70.7)	(67.3)	(70.9)	(52.6)
Northeast Wyoming	(93.0)	(90.6)	(94.8)	(87.9)
Farm Production Expenses ($000)	NA	NA	367,366	637,918

CHAPTER 4

PRESENT AND FUTURE PROBLEMS AND NEEDS WITHOUT A PLAN

Several of the ad hoc groups mentioned earlier in this report developed natural resource baselines and identified the resource problems and needs evident in 1975 and those projected to occur by 1985 (near term) and by 2000 (middle term).

In some instances, the State study teams adjusted the projections to accommodate known local problems and preferences.

Rather than relying on single projections for the near- and long-term, multilevel projections were developed wherever it seemed both appropriate and practical. Such alternative levels were projected for energy, instream flows, and agricultural production.

In order to determine residual needs, i.e., those needs which would not likely be met by the private sector, it was necessary first to determine future conditions "without" a plan. These conditions were derived by analyzing the historical trends of water use and related land activities and projecting them to the future. It is important to note that the "without" condition assumes continuation of ongoing Federal and State programs but assumes no additional involvement or interference.

A summary of results is presented here for each of the seven planning areas, and for the total study area.

Agricultural Production

To establish a base from which to make projections of crop and livestock production needs and capability, reliance was placed on a study of Agricultural Census reports for every five years, 1949-1969, and Statistical Reporting Service data for 1970 through 1974. Derived "base" figures for crop acreages and production were taken as the average of 1972-1974; livestock production and numbers were for 1974.[1]

Two of three projections of crop yields, acreages, and production were based on nationally consistent OBERS[2] estimates of national requirements. These estimates for 1985 and 2000 were disaggregated to the various States by OBERS, and the ad hoc group further disaggregated the State estimates, on a crop-by-crop basis, to the planning areas, using State/county data. Livestock production figures were not available at less than State level, and county livestock numbers were used to disaggregate to the planning areas.

The Series E projections of OBERS are based on a population projection which assumes a birth rate that eventually will result in no further population growth nationwide except for immigration. Series E' projections were based on the same population as Series E, but assumptions relating to the agricultural sector were altered to generate Series E'. The altered assumptions relate primarily to greater national exports, but some adjustments in per capita consumption rates and productivity were made as well.

---

[1] Yellowstone River Basin and Adjacent Coal Area "Agricultural Projections and Supporting Data," Agricultural Ad Hoc Work Group.

[2] An acronym that stands for Office of Business Economics (OBE), now known as Bureau of Economic Analysis, U.S. Dept. of Commerce, and Economic Research Service (ERS), U.S. Dept. of Agriculture.

Table 16
PROJECTED LIVESTOCK PRODUCTION NEEDS

Planning Area	Base	Series E Projection		Series E' Projection		Without Plan		Residual Need E		Residual Need E'	
		1985	2000	1985	2000	1985	2000	1985	2000	1985	2000
		Thousand Pounds									
Beef and											
Veal								34,368	41,596	34,071	53,994
Upper Yellowstone	100,800	141,476	165,322	141,179	177,720	107,108	123,726	13,054	20,813	12,875	28,145
Clarks Fork-Bighorn	64,120	85,218	97,762	85,039	105,094	72,164	76,949	14,356	22,583	14,183	28,575
Tongue-Powder	60,545	82,585	95,855	82,412	101,847	68,229	73,272	30,459	49,716	30,041	67,228
Lower Yellowstone	148,836	198,842	233,517	198,424	251,029	168,383	183,801	-31,022	71,685	-17,311	113,107
North Dakota Tributaries	381,849	407,165	552,338	420,876	593,760	438,187	480,653	2,681	6,974	-2,016	796
Wind-Bighorn-Clarks Fork	107,858	114,563	126,041	109,866	119,863	111,882	119,067	4,123	10,557	-3,100	1,205
Northeast Wyoming	167,496	176,186	190,798	168,963	181,446	172,063	180,241	68,019	223,924	68,743	293,050
Study Area	1,031,504	1,206,035	1,461,633	1,206,759	1,530,759	1,138,016	1,237,709	-1,679	-1,473	-2,021	-1,450
Pork											
Upper Yellowstone	7,303	7,362	8,437	7,020	8,460	9,041	9,910				
Clarks Fork-Bighorn	3,720	5,967	6,838	5,690	6,856	7,328	8,032	-1,361	-1,194	-1,638	-1,176
Tongue-Powder	1,387	670	678	639	679	823	796	-153	-118	-184	-117
Lower Yellowstone	10,665	9,253	10,604	8,824	10,633	11,364	12,456	-2111	-1,852	-2,540	-1,823
North Dakota Tributaries	26,118	26,042	21,679	24,832	21,738	22,638	19,800	3,404	1,879	2,194	1,938
Wind-Bighorn-Clarks Fork	4,999	2,321	1,213	2,213	1,216	6,469	6,894	-4,175	-5,681	-4,256	-5,678
Northeast Wyoming	1,286	451	197	430	198	1,257	1,121	-806	-924	-827	-923
Study Area	55,478	52,066	49,646	49,648	49,780	58,920	59,009	-6,881	-9,363	-9,272	-9,229
Lamb and Mutton											
Upper Yellowstone	2,504	3,114	2,634	1,182	924	2,235	1,692	879	942	-1,053	-768
Clarks Fork-Bighorn	1,636	2,335	2,056	886	721	1,676	1,321	659	735	-790	-600
Tongue-Powder	2,070	3,564	3,442	1,353	1,207	2,558	2,211	1,006	1,231	-1,205	-1,004
Lower Yellowstone	8,344	10,889	10,180	4,134	3,571	7,816	6,540	3,073	3,640	-3,682	-2,969
North Dakota Tributaries	5,232	7,725	8,687	3,077	3,047	4,461	3,597	3,264	5,090	-1,384	-550
Wind-Bighorn-Clarks Fork	11,514	11,751	11,661	4,676	4,091	7,091	5,192	4,660	6,469	-2,415	-1,101
Northeast Wyoming	20,971	31,069	35,404	12,362	12,420	18,749	15,763	12,320	19,641	-6,387	-3,343
Study Area	52,271	70,447	74,064	27,670	25,981	44,586	36,316	25,861	37,748	-16,916	-10,335

Source: Seven Planning Area reports and agricultural Ad Hoc Work Group's report, "Agricultural Projections and Supporting Data."

Within the study area much of the grain, most hay, and all pasture are devoted to maintaining livestock. Livestock production needs were projected by OBERS for six commodities—beef and veal, pork, lamb and mutton, chickens, eggs, and milk. Table 16 shows these needs for the major categories of livestock by the years 1985 and 2000 in relation to the 1975 base.

There is not always a direct correlation in each study area of the projected livestock numbers and related crop and roughage requirements. In view of this, the OBERS E AND E' projections for livestock production were converted to the related feed unit requirements to determine whether the projected production for each planning area and for the Yellowstone study area as a whole was adequate to meet the feed requirements of livestock numbers projected by OBERS (table 17).

Table 17
YELLOWSTONE STUDY AREA
LIVESTOCK FEED UNITS PRODUCED AND CONSUMED
OBERS PROJECTIONS—SERIES E'

Area	Feed Units Produced		Feed Units Required		Excess or Deficit Feed Units		
	Roughage	Grains	Roughage	Grains	Roughage	Grains	Total
	Thousands						
				1985			
Montana							
Upper Yellowstone	1,201,812	241,066	1,794,680	198,781	-593,068	42,285	-550,783
Clarks Fork-Bighorn	936,934	140,115	1,077,231	115,507	-140,297	24,608	-115,689
Tongue-Powder	870,064	79,374	1,046,059	98,662	-175,995	-19,288	-195,283
Lower Yellowstone	2,012,693	393,224	2,528,444	257,072	-515,751	136,152	-379,599
Total	5,021,503	853,779	6,446,614	670,022	-1,425,111	183,757	-1,241,354
North Dakota							
North Dakota Tributaries	5,786,104	1,688,012	5,404,999	631,309	381,105	1,056,703	1,437,808
Wyoming							
Wind-Bighorn-Clarks Fork	1,708,819	247,332	1,421,036	138,462	287,783	108,870	396,653
Northeast Wyoming	2,647,353	234,539	2,244,120	216,666	403,233	17,873	421,106
Total	4,356,172	481,871	3,665,156	355,128	691,016	126,743	817,759
Study Area	15,163,779	3,023,662	15,516,769	1,656,459	-352,990	1,367,203	1,014,213
				2000			
Montana							
Upper Yellowstone	1,289,501	291,970	2,244,867	238,883	-955,366	53,087	-902,279
Clarks Fork-Bighorn	1,120,499	164,809	1,325,961	140,174	-205,462	24,635	-180,827
Tongue-Powder	985,558	84,371	1,287,620	120,135	-302,062	-35,764	-337,826
Lower Yellowstone	2,270,841	520,952	3,180,126	318,555	-909,285	202,397	-706,888
Total	5,666,399	1,062,102	8,038,574	817,747	-2,372,175	244,355	-2,127,820
North Dakota							
North Dakota Tributaries	6,580,822	2,367,064	7,539,045	792,388	-958,223	1,574,676	616,453
Wyoming							
Wind-Bighorn-Clarks Fork	2,000,302	300,973	1,539,719	144,758	460,583	156,215	616,798
Northeast Wyoming	3,079,352	243,511	2,397,819	225,451	681,533	18,060	699,593
Total	5,079,654	544,484	3,937,538	370,209	1,142,116	174,275	1,316,391
Study Area	17,326,875	3,973,650	19,515,157	1,980,344	-2,188,282	1,993,306	-194,976

Analysis of table 17 indicates that the individual planning areas may or may not be able to meet their own needs, but that the Yellowstone Study Area as a whole will not.

Based on projected production requirements, table 18 shows, in the first three columns, the base agricultural acreages as well as those projected by OBERS to the target years 1985 and 2000 for Series E and E'. Here the lesser future acreages, despite greater volumes of projected needed production, reflect higher unit yields with continued improvements in technology and farm management.

Table 18
PROJECTED NEEDS FOR AGRICULTURAL ACREAGE

	Harvested Acreage										
	Base	Series E		Series E'		Ad Hoc Group 3E/3E'		Without Plan		3E/3E' Residual Need	
Planning Area	1975	1985	2000	1985	2000	1985	2000	1985	2000	1985	2000
	Thousand Acres										
Upper Yellowstone											
Irrigated	175	155	156	158	159	384/359	412/442	188	207	196/171	205/235
Nonirrigated	290	231	227	276	298	— —	— —	290	290	-59/-14	-63/8
Clarks Fork-Bighorn											
Irrigated	116	100	100	102	103	157/137	151/149	120	124	37/17	27/25
Nonirrigated	162	138	140	168	188	— —	— —	162	162	-34/6	-22/26
Tongue-Powder											
Irrigated	31	30	32	30	32	108/93	118/116	33	36	75/60	82/80
Nonirrigated	104	79	79	101	117	— —	— —	104	104	-25/-3	-25/13
Lower Yellowstone											
Irrigated	144	138	146	146	155	359/285	426/373	169	207	190/116	218/166
Nonirrigated	853	619	583	750	799	— —	— —	853	853	-238/-103	-270/-54
North Dakota Tributaries											
Irrigated	56	91	148	102	178	91/102	148/413	86	135	5/16	13/278
Nonirrigated	3,621	3,562	3,685	4,008	4,515	— —	— —	3,359	3,180	203/649	505/1302
Wind-Bighorn-Clarks Fork											
Irrigated	328	307	307	336	346	307/366	307/347	337	346	-30/-1	-40/-0
Nonirrigated	1	1	0+	0+	0+	— —	— —	1	1	-1/-1	-1/-1
Northeast Wyoming											
Irrigated	94	94	98	101	107	94/101	98/107	109	109	-15/-8	-11/-2
Nonirrigated	246	196	174	225	253	— —	— —	238	228	-42/-13	-54/-25
Study Area											
Irrigated	952	915	987	975	1,080	1500/1413	1660/1947	1,042	1,172	468/371	488/775
Nonirrigated	5,277	4,826	4,888	5,828	6,170	— —	— —	5,007	4,818	-181/521	70/1302

Source. Seven Planning Area reports and Agricultural Ad Hoc Work Group's report, "Agricultural Projections and Supporting Data."

Table 19

MUNICIPAL, RURAL DOMESTIC, AND LIVESTOCK WATER[a/]

Planning Area	Municipal[b/] 1975	Municipal[b/] 1985	Municipal[b/] 2000	Rural Domestic[c/] 1975	Rural Domestic[c/] 1985	Rural Domestic[c/] 2000	Livestock Water E/E'/Pond Evaporation[d/] 1975	Livestock Water E/E'/Pond Evaporation[d/] 1985	Livestock Water E/E'/Pond Evaporation[d/] 2000
	Average Annual Water Consumption — Thousand Acre-Feet								
Upper Yellowstone									
Low	—	8.1	8.9	—	—	—	—	—	—
Most Probable	6.8	8.2	9.1	0.3	0.3	0.3	3.8/3.8/8.9	5.3/5.2/9.5	5.9/6.4/11.0
High	—	8.2	9.3	—	—	—	—	—	—
Clarks Fork-Bighorn									
Low	—	1.1	1.3	—	—	—	—	—	—
Most Probable	1.1	1.2	1.5	0.2	0.2	0.2	2.5/2.5/9.2	3.3/3.2/10.4	3.7/3.9/11.0
High	—	1.2	1.5	—	—	—	—	—	—
Tongue-Powder									
Low	—	1.0	1.2	—	—	—	—	—	—
Most Probable	0.8	1.2	2.2	0.1	0.1	0.1	2.3/2.3/17.8	3.1/3.1/20.0	3.6/3.7/22.1
High	—	1.5	3.5	—	—	—	—	—	—
Lower Yellowstone									
Low	—	3.0	3.5	—	—	—	—	—	—
Most Probable	2.8	3.2	3.9	0.5	0.5	0.5	5.9/5.9/28.5	7.8/7.5/31.7	9.0/9.3/37.4
High	—	3.1	3.9	—	—	—	—	—	—
North Dakota Tributaries									
Low	—	—	—	—	—	—	—	—	—
Most Probable	10.2	12.3	16.7	1.4	1.4	1.4	19.0/19.0/47.0	20.2[d/]20.6/52.0	26.8/28.7/70.0
High	—	13.6	17.2	—	—	—	—	—	—
Wind-Bighorn-Clarks Fork									
Low	—	—	—	—	—	—	—	—	—
Most Probable	7.9	8.8	10.2	0.4	0.4	0.4	6.0/6.0/4.9	6.3/6.3/6.0	6.7/6.7/9.1
High	—	—	—	—	—	—	—	—	—
Northeast Wyoming									
Low	—	—	—	—	—	—	—	—	—
Most Probable	5.0	15.0	20.0	4.8	4.8	4.8	3.7/3.7/5.5	4.5/4.4/6.7	5.9/5.7/8.5
High	—	—	—	—	—	—	—	—	—
Study Area									
Low	—	—	—	—	—	—	—	—	—
Most Probable	34.6	63.1	63.6	3.3	3.3	3.3	43.2/43.2/121.8	50.5/50.3/136.3	61.6/64.4/169.1
High	—	—	—	—	—	—	—	—	—

a/ Planning area report estimates

b/ Generally about 35-50 percent of diversion requirement

c/ Based on unit requirements in the 1975 National Water Assessment and rural farm population projections in Yellowstone Study.

d/ Requirements for 1975, increased to accommodate 1985/2000 livestock population increases for E and E'.

Municipal, Rural Domestic, and Livestock Water

The amount of water diverted from streams or withdrawn from aquifers for municipal, rural domestic, and livestock watering purposes varies greatly throughout the study area. For purposes of this study, estimates of 100 gallons per capita per day (gpcd) in rural areas to 200 gpcd in some cities were used to determine municipal water requirements. This averages out to about 150-185 gpcd. It is worth noting that while energy-related development will add significantly to the requirements of a given community, the overall study area impact is not great. Consumptive use values were estimated at 35-60 percent of average per capita uses to give the average annual amounts shown in table 19. Rural domestic water consumption estimates in table 19 reflect unit usage as determined in the 1975 National Water Assessment and rural farm population as determined in the Yellowstone Study.

Livestock water needs were estimated by multiplying the estimatedlllivestock numbers based on Series E and E' production projections by the consumption rates established for each type of animal. Estimates also were developed for livestock water impoundment evaporation which for the study area is greater in magnitude than the direct animal consumption.

Future requirements for municipal, rural domestic, and livestock water can generally be met under ongoing programs without the addition of plan elements.

Nonenergy Industry

Nonenergy industrial water is comprised of water needed for manufacturing and for the mining and processing of nonenergy minerals. In the case of nonenergy minerals—both metallic and nonmetallic—estimates were developed initially for each State located within the study area and later allocated to individual planning areas on a judgment basis. As reflected in table 20, about 85 percent of the total is the result of projected mining and the concentration of copper in the Wind-Bighorn-Clarks Fork area of Wyoming.

Table 20
NONENERGY INDUSTRY WATER

Planning Area	Water Consumption (Average Annual)					
	1975		1985		2000	
	Mfg[a/]	NMP[b/]	Mfg	NMP	Mfg	NMP
	Thousand Acre-Feet					
Upper Yellowstone	8.7	0+	9.4	0.1-	10.1	0.7
Clarks Fork-Bighorn[c]	Negl	Negl	Negl	Negl	Negl	Negl
Tongue-Powder[c/]	Negl	Negl	Negl	Negl	Negl	Negl
Lower Yellowstone	2.9	0+	3.1	0+	3.3	0+
North Dakota Tributaries	0+	0+	0+	0.1-	0+	0.1
Wind-Bighorn-Clarks Fork	0.1-	0.1	0.1	2.2	0.2	5.8
Northeast Wyoming	0.4	0.1	0.3	0.1	0.3	0.1
Study Area	12.1	0.2	12.9	2.5	13.9	6.7

a Mfg Manufacturing
b/ NMP Nonenergy mineral mining and processing
c Because historical and projected uses are so small, area demands are included in the municipal demands reflected in table 19

Energy Industry

It is apparent that the Yellowstone study area faces the possibility of an emerging expansion of energy-related activities and potentially major impacts, as a result, on both the human and natural environment. While the potential for increased activity in the development of uranium, natural gas, and oil is certainly present, emphasis is currently being placed on the area's coal reserves.

One of the objectives of the Yellowstone study was to evaluate the area's capability to satisfy the water and land needs associated with energy development. Since energy development is to a major degree a function of the private sector, and since it is virtually impossible to determine in any definitive way the location, magnitude, and timing of such development, a number of alternative levels of development—each having different land and water requirements—were evaluated.

Oil and Gas

Production and reserves of crude oil in the Yellowstone study area account for about 5 percent of the nationwide totals while the output and reserves of natural gas are insignificant on a national scale. An estimated 150 million barrels of Yellowstone crude oil was produced in 1975, three-quarters of this in Wyoming.

Under existing "without" conditions, the U.S. demand for crude oil nationally is expected to continue to rise through the near term, from 6.0 billion barrels in 1975 to 8.3 billion barrels in 1985. Domestic production, under the influence of rising prices, is also expected to show a near-term increase—from 2.9 billion barrels to 4.1 billion barrels. Crude oil production in the Yellowstone study area will probably reflect these national trends.

To meet new petroleum demands, exploratory drilling in new areas and at greater depths will have to be conducted nationally. In addition to costing more, this exploration will place increasing demands on land resources within the study area. In this respect, industrial need for access to expanded drilling areas will be contending both with existing surface uses and mounting demands for more intensive and exclusive recreation uses.

Drilling water needs have been minor and are not expected to increase significantly.

Petroleum industry water requirements for secondary recovery by water-flooding will also increase. In the past, these needs generally have been met by pumping from deeper aquifers, which are relatively inaccessible and sometimes of lower quality water than is suitable for most purposes. As a result, conflicts have been minimal, but with increasing interest in the tapping of ground water supplies of varying quality for coal-related development, previously uncontested aquifer sources may become less readily available.

Uranium

Current production levels and reserves described in chapter 2 indicate that the area can respond significantly to national uranium needs. While uranium can be found in western South Dakota, southwestern North Dakota, and eastern Montana, the Wyoming Basin District is already producing and shows the greatest potential. Its discovered and probable reserves aggregate some 1.2 million tons of U_3O_8 which appear to be economically feasible to mine now and in the future. Total production in the study area was about 1,500 tons of U_3O_8 in 1975.

Demands undoubtedly will increase. Current forecasts show the uranium industry having an apparent capability to meet demands of the electrical power industry at least through the 1980's. The Energy Research and Development Administration has indicated a probable gap beyond 1980 between needs and "proven and probable" reserves. In view of this gap potential and in recognition of the lead time needed before uranium mining can commence, continued exploration is necessary. Unlike coal deposits, uranium deposits tend to be small and difficult to find.

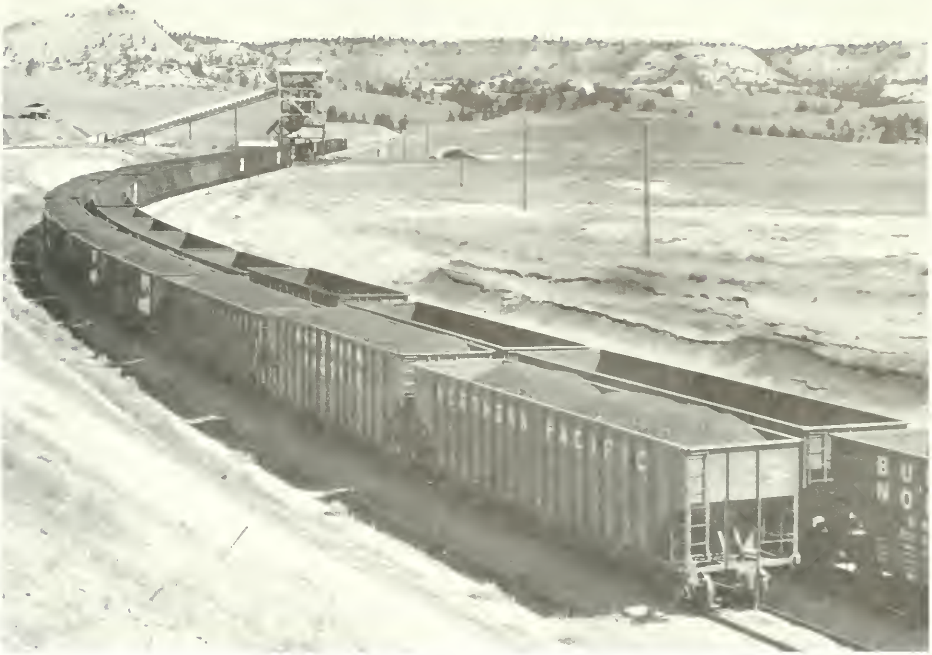
With about 58 percent of the present milling capacity and largely proven reserves, the Gas Hills District in central Wyoming probably will show some added mine development, but its mill capacity (now 5,500 tons of ore per day) is not expected to increase. For the southern Powder River Basin, exploration undoubtedly will be very active and added mine and mill development (presently 3,000 tons of ore per day) should double by 1985. Beyond 1985, new reserve discoveries could profoundly increase uranium production in the study area.

For open pit mines, water is needed for dust control, vehicle maintenance, and potable uses. For underground operations, drilling needs must be added. Milling requires water for leaching and associated processes and normally for the slurry line transport of tailings. However, water pumped from the mining pits of underground mines usually proves adequate for mine and mill requirements. Other potential operations may draw upon ground water supplies, but the quantity impact should not be too significant. In view of this, the primary effects are apt to be the social and environmental impacts.

Coal and Related Industrial Production

The emergence of a national shortage of oil supplies and the presence of huge reserves of strippable, low-sulpher coal in the study area have created a potential for large-scale coal mining and some degree of coal conversion. In view of this, it is essential that the study area face up not only to its own future requirements but also to its share in meeting the Nation's needs. In doing so, it is important to recognize that while all but one of the area's four small hydroelectric plants and two larger ones (Yellowtail 250 MW, and Garrison 400 MW) are expected to remain in production, the opportunity for added hydroelectric capacity is relatively limited. Large increases in thermal power generation would make desirable some added hydroelectric development for peaking, and the area does have some potential in this respect, but meeting the needs overall is dependent largely on coal-burning fuel plants. The area is already caught up in a regional, largely integrated system of plants and facilities, to fulfill both regional and export needs of the future. This makes it doubly important that a broad range of needs, forecasts, and alternative ways of meeting those needs be evaluated, not only to determine how much of the need the area can and is willing to meet, but also to minimize whatever adverse impacts might be associated with development.

A model was developed to provide a basis for forecasting the possible level, type, and location of future energy development and associated resource requirements under alternative energy policies and programs. Brief highlights herein are from the basic study by Harza Engineering Company, "Analysis of Energy Projections and Implications for Resource Requirements," December 1976, conducted as a part of the level B efforts.



The Harza results are not to be viewed as a goal or recommended plan for energy development; rather, they illustrate the implications of three distinct sets or scenarios of energy policy and program assumptions for the years 1985 and 2000. Variations of these three basic runs were made by applying constraints of one kind or another as considered appropriate and desirable:

1. A *low* rate of regional development, including coal production to meet only local needs and to cover exports already contracted or highly probable;

2. A *most probable* rate of development consistent with national energy consumption and production forecasts; and

3. A *high* rate of development based on the maximum contribution that the study area energy resources could reasonably be expected to make in alleviating shortages in domestic nuclear generation and eliminating national reliance on imported oil and gas.

For national/regional consistency, the study involved two components: (1) a "macro" level analysis which considered national energy supply and demand interaction and identified the Northern Great Plains' share of national energy production[3]; and (2) a "micro" level analysis which focused on energy development of the Yellowstone study area. Basically, the location, amount, and type of energy development within the study area was projected considering the relative economic advantages within the national energy system and subject to limitations on availability of resources, land ownership, land use, environment, transportation facilities, equipment availability, and public attitudes and preferences regarding development and conservation.

For the initial runs of the Harza model, an assumption was made that presently existing taxation and environmental policies would remain relatively unchanged into the future.

---

[3]Developed by the Federal Energy Administration and summarized in National Energy Outlook for 1976

Four steps were considered in the process of meeting the demand for coal:

1. Mining—National requirements were projected for coal supply regions 7 and 8, which cover the same geographic area as Northern Great Plains (NGP) supply areas 1 through 9, shown by figure 12. Six of the NGP supply regions fall within the Yellowstone study area, and the model was programmed to isolate demands for each of them. Inputs permitted the model to weigh several variables, including mining costs, capacities, overburden ratios, mine life, and strippable reserves;

2. Transportation to Processor—Provisions were made to transport utility coal to processing site by unit train, slurry pipeline, or unit train/waterway combination and industrial coal by conventional train. Both costs of transport and capacity constraints were determined for all mining/demand area combinations and each alternative transportation mode;

3. Processing—At the processing site, coal can be converted to electricity or synthetic gas or used for industrial purposes. Each process has separate production costs and capacities; and

4. Transportation—Processor to Consumer—For coal converted to electricity in the study area, provisions were included to transport it from point of conversion to demand point by transmission lines. Gas pipelines were not included in the model; rather, the activities associated with gasification were handled outside of the model because gasification is not economically competitive before year 2000.

Overall, the objective in the model was to meet demands of each scenario at the least cost for mining, coal transportation, conversion to electricity, and electrical transmission. Mining costs include land reclamation fees and severance costs; conversion costs include emission taxes.

The "high" scenario provides an indication of the maximum contribution the study area may reasonably be expected to make in meeting na-

tional energy needs constrained primarily by energy demands. Here, the report shows 12 underlying assumptions:

1. Economic / technological / environmental / social / legal / institutional constraints remaining essentially as now applied;

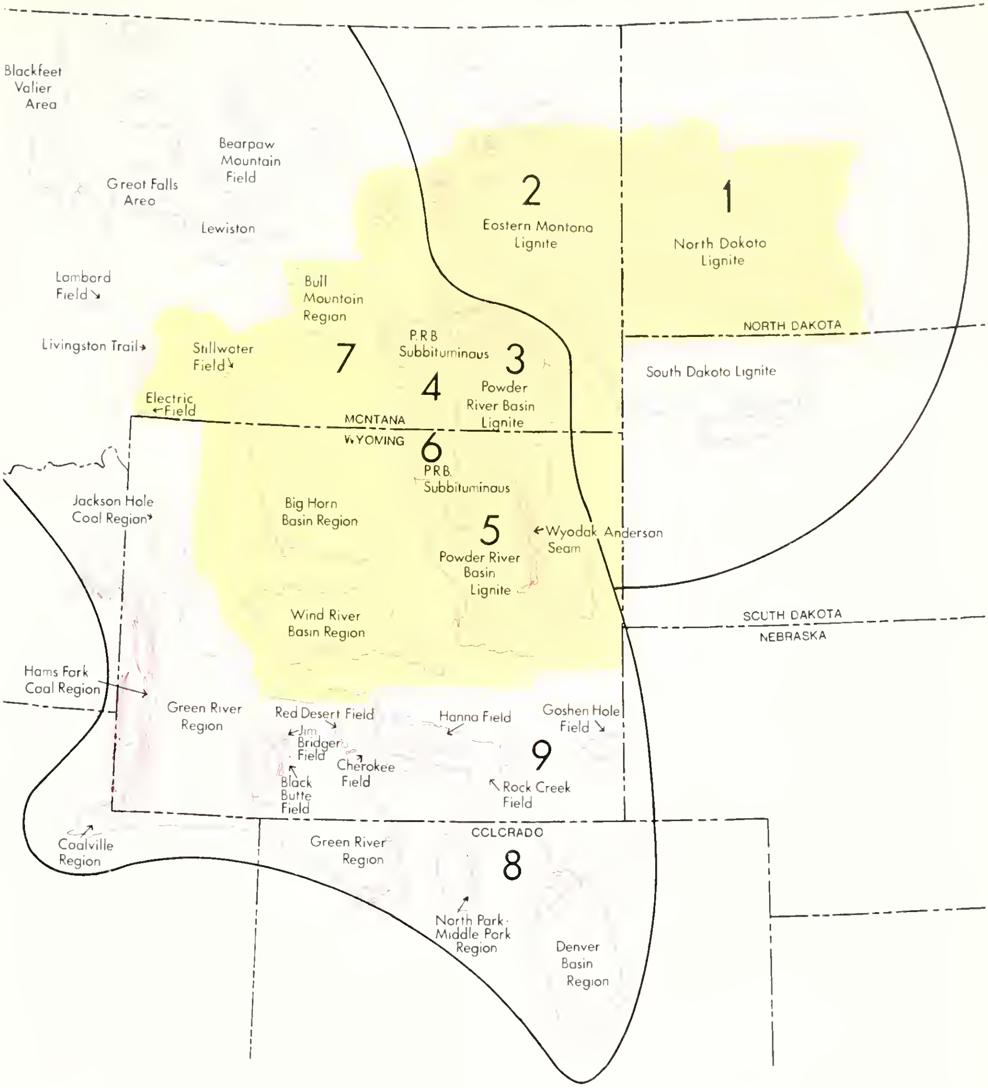
2. Present taxation/environmental policies unchanged;

3. Adequate capital/low risk/attractive wages;

4. Study area producing 85 percent of coal supply regions 7-8 and southern Colorado-Wyoming 15 percent;

5. Social/environmental problems limiting coal production to 100 million tons in 1985 and 200 million tons by 2000 in each mining area;

6. Mining not occurring within one mile of cities/towns, under State/Federal highways, on irrigated croplands, on valley floors of major streams/tributaries, or in unique environmental areas;



LEGEND

Boundary of Project Independence Evaluation System (PIES)
Coal Supply Regions
Yellowstone Study Area
1-9 Numbers Designating Coal Mining Areas
Major Coal Reserve Areas Within the Study Area

Figure 12
Coal Field Delineation

7. Net available link capacities of existing railroad lines being expanded to 40 million tons by 1985 and to 100 million tons by 2000 (upgraded single track, centralized traffic control by 1985—alternating 10 miles each automated single and double track by 2000);

8. Institutional/social/environmental obstacles to long distance slurry lines being removed in the near future, but only when railroad capacities are saturated to the time-capacity levels heretofore listed;

9. Water supplies delivered to demand point not to exceed $450/acre-foot;

10. Use of mechanical draft towers when water costs exceed $450;

11. New transmission lines as necessary to transmit any additional energy by this mode; and

12. Financial incentives available from the Federal Government or private sources to construct one gasification plant by 1985; beyond 1990 rapid expansion of gasification is assumed; and by 2000, resource availability, environmental concerns, and social preferences will act as the primary constraint.

For the "most probable" scenario, the assumptions are the same as for the 'high" scenario, but institutional/social/environmental obstacles will preclude long distance slurry line development. Moreover, uncertainties regarding the amount of coal to be moved by rail will preclude large capital investments in fixed plant facilities necessary to expand rail capacities beyond "high" scenario levels.

The "low" scenario assumptions are:

1. Production sufficient only to meet local needs and exports already guaranteed or highly probable; and

2. No gasification to occur by the year 2000.

This limits annual mining capacity to 111 million tons by 1985, and lack of added requirements beyond that time hold this limit.

Highlights of information for these three alternatives are displayed in table 21. This reflects wide variances in coal production, exports, magnitude of conversions, water/land requirements, pollution emissions, and labor. Recognizing the urgency of the Nation's current and projected energy needs, the "high" level could be viewed as the "without plan" for all resource and socioeconomic components shown. However, it is important to note that for some planning areas, the Harza "high" level (without plan) was amended to take into account constraints imposed by State governments and to accommodate local concerns and actions that will limit what can be accomplished.

Table 21
ENERGY ACTIVITIES, RESOURCE REQUIREMENTS, AND AIR POLLUTION EMISSIONS
ALTERNATIVE REGIONAL ENERGY DEVELOPMENT SCENARIOS
LOW LEVEL

Resource	Tongue-Powder		Lower Yellowstone		North Dakota Tributaries		Northeast Wyoming	
	1985	2000	1985	2000	1985	2000	1985	2000
Coal Production (1,000 tons)	25,000	25,000	500	500	11,000	11,000	74,500	74,500
Number of Mines	6	6	1	1	6	6	12	12
Exports (1,000 tons)	21,900	21,900	400	400	5,500	5,500	73,100	73,100
Rail (1,000 tons)	21,900	21,900	400	400	5,500	5,500	73,100	73,100
Slurry (1,000 tons)	0	0	0	0	0	0	0	0
Conversion (1,000 tons)	3,100	3,100	100	100	5,500	5,500	1,400	1,400
Thermal Electricity (1,000 tons)	3,100	3,100	100	100	5,500	5,500	1,400	1,400
Capacity (Megawatts)	900	900	50	50	1,222	1,222	390	390
Generation (Gigawatt-hours)	5,519	5,519	307	307	7,493	7,493	2,392	2,392
Plants (500 Megawatts)	4	4	1	1	6	6	3	3
Syngas (1,000 tons)	0	0	0	0	0	0	0	0
Capacity (Millions cf/d)	0	0	0	0	0	0	0	0
Plants (250 Millions cf/d)	0	0	0	0	0	0	0	0
Water Requirements (Total Acre-Feet)	15,702	15,702	822	822	20,592	20,592	9,586	9,586
Mines	500	500	10	10	220	220	1,490	1,490
Reclamation	1,405	1,405	45	45	1,639	1,639	2,117	2,117
Coal Gasification	0	0	0	0	0	0	0	0
Electrical Generation	13,797	13,797	767	767	18,733	18,733	5,979	5,979
Slurry Pipeline	0	0	0	0	0	0	0	0
Land Requirements								
Strip Mines (Acres-Year)	360	360	12	12	421	421	543	543
Other Coal Needs (Acres)	1,746	1,746	57	57	1,716	1,716	2,654	2,654
Air Pollution Emissions								
Particulates (Tons/Year)	541	541	30	30	733	733	233	233
Sulfur Oxides (Tons/Year)	4,510	4,510	250	250	6,110	6,110	1,940	1,940
Nitrogen Oxides (Tons/Year)	451	451	25	25	611	611	194	194
Labor (Number of Employees)								
Operating	617	617	17	17	379	379	1,540	1,540
Mines	500	500	10	10	220	220	1,490	1,490
Syngas	0	0	0	0	0	0	0	0
Electrical Generation	117	117	7	7	159	159	50	50
Construction	0	0	0	0	0	0	0	0
Mines	0	0	0	0	0	0	0	0
Syngas	0	0	0	0	0	0	0	0
Electrical Generation	0	0	0	0	0	0	0	0
Capital Requirements (Millions of Dollars)	0	0	0	0	26	26	295	295
Mines	0	0	0	0	26	26	295	295
Syngas	0	0	0	0	0	0	0	0
Electrical Generation	0	0	0	0	0	0	0	0

Table 21 (Con't.)
ENERGY ACTIVITIES, RESOURCE REQUIREMENTS,
AND AIR POLLUTION EMISSIONS
ALTERNATIVE REGIONAL ENERGY DEVELOPMENT SCENARIOS
HIGH LEVEL

Resource	Tongue-Powder 1985	Tongue-Powder 2000	Lower Yellowstone 1985	Lower Yellowstone 2000	North Dakota Tributaries 1985	North Dakota Tributaries 2000	Northeast Wyoming 1985	Northeast Wyoming 2000
Coal Production (1,000 Tons)	100,000	200,000	36,300	230,100	54,090	158,260	103,500	203,500
Number of Mines	20	40	7	46	11	32	21	41
Exports (1,000 Tons)	96,900	196,900	36,200	173,000	19,200	25,600	102,000	157,500
Rail (1,000 Tons)	56,300	152,600	7,000	40,600	0	0	63,800	118,700
Slurry (1,000 Tons)	40,600	44,300	29,200	132,400	19,200	25,600	38,200	38,800
Conversion (1,000 Tons)	3,110	3,110	120	57,120	34,900	132,600	1,500	46,000
Thermal Electricity (1,000 Tons)	3,110	3,110	120	120	24,600	28,600	1,500	1,500
Capacity (Megawatts)	900	900	50	50	8,870	8,873	390	390
Generation (Gigawatt-Hours)	5,521	5,521	158	158	34,198	40,806	2,393	2,393
Plants (500 Megawatts)	2	2	1	1	18	18	1	1
Syngas (1,000 Tons)	0	0	0	57,000	10,300	104,000	0	44,500
Capacity (Millions cf/d)	0	0	0	1,500	250	2,524	0	1,330
Plants (250 Millions cf/d)	0	0	0	6	1	10	0	5
Water Requirements (Total Acre-Feet)	45,800	55,607	3,397	163,326	115,987	224,779	34,145	92,320
Mines	2,000	4,000	726	4,602	1,082	3,165	2,069	4,069
Reclamation	5,620	11,240	2,277	13,940	8,060	23,580	3,111	5,911
Coal Gasification	0	0	0	60,021	9,986	100,828	0	53,044
Electric Generation	13,804	13,804	394	394	85,494	102,015	5,982	5,982
Slurry Pipeline	24,376	26,563	0	84,369	11,365	15,191	22,982	23,314
Land Requirements								
Strip Mines (Acres-Year)	1,440	2,880	583	3,572	2,072	6,061	798	1,516
Other Coal Needs (Acres)	3,900	6,900	1,139	9,955	10,992	18,663	3,494	9,146
Air Pollution Emissions								
Particulates (Tons/Year)	2,761	2,761	79	6,184	18,114	30,655	1,196	6,585
Sulfur Oxides (Tons/Year)	33,129	33,129	946	67,978	216,331	357,363	14,356	73,541
Nitrogen Oxides (Tons/Year)	27,607	27,607	789	45,534	178,435	279,211	11,963	51,493
Labor (Number of Employees)								
Operating	1,987	4,037	678	8,297	2,868	10,755	1,971	7,136
Mines	1,870	3,920	671	4,538	1,091	3,300	1,920	3,770
Syngas	0	0	0	3,752	624	6,302	0	3,315
Electrical Generation	117	117	7	7	1,153	1,153	51	51
Construction	340	180	2,490	2,250	2,200	4,440	1,650	1,870
Mines	340	180	320	500	230	240	310	210
Syngas	0	0	2,170	1,750	410	4,200	1,340	1,660
Electrical Generation	0	0	0	0	1,560	0	0	0
Capital Requirements (Millions of Dollars)	446	1,016	170	7,221	3,733	13,362	515	6,337
Mines	446	1,016	170	1,217	225	775	515	1,030
Syngas	0	0	0	6,004	998	10,079	0	5,307
Electrical Generation	0	0	0	0	2,510	2,508	0	0

Table 21 (Con't.)
ENERGY ACTIVITIES, RESOURCE REQUIREMENTS, AND AIR POLLUTION EMISSIONS
ALTERNATIVE REGIONAL ENERGY DEVELOPMENT SCENARIOS
MOST PROBABLE LEVEL

	Tongue-Powder		Lower Yellowstone		North Dakota Tributaries		Northeast Wyoming	
Resource	1985	2000	1985	2000	1985	2000	1985	2000
Coal Production (1,000 Tons)	84,650	200,000	19,490	68,890	17,160	112,400	41,500	136,500
Number of Mines	77	40	4	14	3	23	8	26
Exports (1,000 Tons)	80,000	196,000	19,400	30,800	0	0	40,000	108,500
Rail (1,000 Tons)	80,000	196,000	19,400	30,800	0	0	40,000	108,500
Slurry (1,000 Tons)	0	0	0	0	0	0	0	0
Conversion (1,000 Tons)	4,600	4,000	90	90	17,160	112,400	1,500	28,000
Thermal Electricity (1,000 Tons)	4,600	4,000	90	90	6,860	29,400	1,500	1,500
Capacity (Megawatts)	1,369	1,370	50	50	2,914	9,182	390	390
Generation (Gigawatt-Hours)	8,395	7,001	158	158	9,191	41,766	2,393	2,393
Plants (500 Megawatts)	3	2	1	1	6	18	1	1
Syngas (1,000 Tons)	0	0	0	38,000	10,300	83,000	0	26,500
Capacity (Millions cf/d)	0	0	0	100	250	2,024	0	790
Plants (250 Millions cf/d)	0	0	0	4	1	8	0	3
Water Requirements (Total Acre-Feet)	27,437	32,742	2,532	46,689	35,879	203,872	8,184	44,115
Mines	1,683	4,000	390	1,377	345	2,247	828	2,638
Reclamation	4,757	11,240	1,748	4,903	2,571	16,742	1,374	3,907
Coal Gasification	0	0	0	40,014	9,986	80,469	0	31,588
Electrical Generation	20,987	17,502	394	394	22,978	104,415	5,982	5,982
Slurry Pipeline	0	0	0	0	0	0	0	0
Land Requirements								
Strip Mines (Acres-Year)	1,219	2,880	448	1,257	661	4,303	353	1,002
Other Coal Needs (Acres)	3,908	7,370	635	4,117	3,931	16,577	1,633	5,927
Air Pollution Emissions								
Particulates (Tons/Year)	4,197	3,500	79	4,149	5,611	29,065	1,196	4,405
Sulfur Oxides (Tons/Year)	50,369	42,000	946	45,634	66,291	340,402	14,356	49,601
Nitrogen Oxides (Tons/Year)	41,974	35,005	789	30,619	53,401	268,831	11,963	35,503
Labor (Number of Employees)								
Operating	1,755	4,098	367	3,850	1,357	8,479	823	4,471
Mines	1,577	3,920	360	1,342	354	2,256	772	2,446
Syngas	0	0	0	2,502	624	5,029	0	1,974
Electrical Generation	178	178	7	7	379	1,194	51	51
Construction	70	0	380	1,185	1,320	4,830	1,110	1,090
Mines	70	0	130	225	160	280	200	200
Syngas	0	0	0	960	410	3,280	910	890
Electrical Generation	0	0	250	0	750	1,270	0	0
Capital Requirements (Millions of Dollars)	517	1,170	74	4,215	1,603	11,158	197	3,821
Mines	364	1,016	74	325	48	505	197	661
Syngas	0	0	0	4,003	998	8,044	0	3,160
Electrical Generation	153	154	0	0	557	2,608	0	0

Table 22
CURRENT AND PROJECTED STATUS OF LAND CONSERVATION

Planning Area and Ownership	Total Land Area	Land Conservation Needs			Land Conservation Costs		
		1975	1985	2000	1975	1985	2000
	Thousand Acres				Thousand Dollars		
Upper Yellowstone	5,927	1,515	1,180	894	59,840	48,900	38,577
Federal	1,471	99	48	32	3,509	2,690	1,970
Non-Federal	4,456	1,416	1,132	862	56,331	46,210	36,607
Clarks Fork-Bighorn	3,456	1,371	1,100	822	29,554	24,204	19,197
Federal	591	97	79	51	1,132	926	606
Non-Federal	2,865	1,274	1,021	771	28,422	23,278	18,591
Tongue-Powder	5,256	2,494	1,938	1,439	30,323	24,106	18,390
Federal	1,255	369	238	160	5,866	4,236	3,083
Non-Federal	4,001	2,125	1,700	1,279	24,457	19,870	15,307
Lower Yellowstone	17,603	6,253	5,085	3,606	124,999	99,918	73,253
Federal	3,172	1,077	976	504	12,419	11,511	5,797
Non-Federal	14,431	5,176	4,109	3,102	112,580	88,407	67,456
North Dakota Tributaries	13,911	5,772	4,656	3,609	170,614	141,840	101,384
Federal	1,559	447	46	33	5,054	2,926	2,238
Non-Federal	12,352	5,325	4,610	3,576	165,560	138,914	99,146
Wind-Bighorn-Clarks Fork	14,561	5,558	4,811	3,982	102,354	86,791	68,988
Federal	9,288	2,118	1,675	1,118	30,668	24,904	17,159
Non-Federal	5,273	3,440	3,136	2,864	71,686	61,887	51,829
Northeast Wyoming	17,992	14,213	13,004	11,488	106,863	91,242	71,988
Federal	3,571	1,361	1,150	544	26,457	19,058	7,133
Non-Federal	14,421	12,852	11,854	10,944	80,406	72,184	64,855
Study Area	78,706	37,176	31,774	25,840	624,547	517,001	391,777
Federal	20,907	55,568	4,212	2,442	85,105	66,251	37,986
Non-Federal	57,799	31,608	27,562	23,398	539,442	450,750	353,791

Source: Level B Land Conservation Measures Ad Hoc Report Minor differences in total land area as shown above and in table 1 are covered by use of different data sources

Land Conservation

Land conservation measures are recommended to make wise use of soil, water, and plant resources by providing treatment so as to preserve, maintain, and enhance resource values. These measures may include both vegetative and mechanical practices and improved management of the existing resource. In many areas only proper management is required to protect the resource.

The current status of land conservation is that about 41.6 million acres (53 percent) are adequately treated in the study area. These include both lands that have been treated and those that do not need treatment from the forces of water, wind, fire, and climate. In 1975 there were about 37.2 million acres classed as needing treatment.

The future land conservation needs without a plan were derived on the basis of anticipated funding and activity under current ongoing programs. Current and projected status of land conservation for Federal and non-Federal lands is shown for each of the planning areas in table 22.

A special problem encountered, particularly in four counties in Montana, is that of saline seeps. This condition is caused by underground water which reaches the surface and, through evaporation, leaves a white crust (figure 13) consisting of magnesium, sodium, sulfates, and nitrates that is damaging to dryland crop production and may be harmful to drinking water. The problem stems from the geology of the affected areas, but is aggravated by the crop-fallow dryland farming system now in use, particularly for wheat. Because the source of the problem may be wholly or in part on lands other than those of the landowner adversely affected, solutions can be extremely difficult to attain.

Figure 13
Saline Seep Formation Process

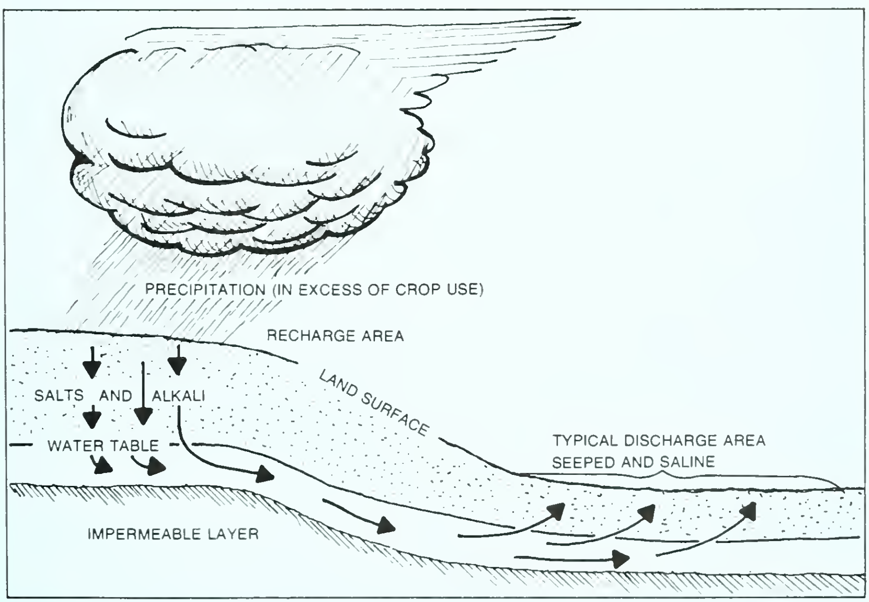


Table 23
ESTIMATED ACREAGES AFFECTED BY SALINE SEEPS AND IRRIGATION SALINITY

Planning Area	Saline Seeps[a]	Irrigation Salinity
	Acres	
Upper Yellowstone	23,600	6,570
Clarks Fork-Bighorn	1,000	17,350
Tongue-Powder	NA[b/]	NA[b/]
Lower Yellowstone	15,930	1,330
North Dakota Tributaries	NA[b/]	NA[b/]
Wind-Bighorn-Clarks Fork	NA[b/]	97,800[c/]
Northeast Wyoming	NA[b/]	NA[b/]

a. Investigation of salinity in hydrological systems in Montana—Water Quality Bureau, July 1975.
b/ Information not available, affected areas are not believed substantial.
c/ Soil Conservation Service, Wind-Bighorn-Clarks Fork Basin Type IV Survey

Table 23 sets forth information on the acreages adversely affected by saline seeps and irrigation salinity. The wet and saline soil areas indicated for the Wind-Bighorn-Clarks Fork planning area could show increased agricultural production by improving agricultural water management and irrigation and drainage systems.

Flood Control and Streambank Erosion

Flood and streambank erosion control needs are expressed as estimates of damages to lands and existing and potential property by current and future human activities. Properties subject to damage include buildings, roads, utilities, and planted crops required to carry on commerce, transportation, and farming operations.

A fairly comprehensive analysis of flood damages was made by the Soil Conservation Service for tributaries having less than 400 square miles of drainage area and by the Corps of Engineers for main stem reaches having at least 400 square miles of drainage area in the Missouri River Basin Comprehensive Framework Study.

These estimates were based on an evaluation of the primary tangible losses that could be expected from potential flood occurrences with existing development in the flood plain and existing protective works—no attempt was made to include losses such as loss of life, health hazards, and disruption of transportation that cannot be expressed in dollars. Basic flood damage projections contained in the 1975 National Water Assessment were used to obtain projection factors for future flood damages. OBERS E projections of population, personal income, and total agricultural earnings were used to generate composite factors reflecting flood damage increases. Included were three classifications of damages: (1) crop and pasture; (2) other rural; and (3) urban.

Table 24 summarizes probable average annual flood damages by planning area only, though the estimates were initially developed on a stream-by-stream basis. Distributed about equally between tributary and main stem areas, needs for control can be expected to increase about 13 percent by 1985 and nearly 42 percent by the year 2000.

Table 24
CURRENT AND PROJECTED FLOOD CONTROL NEEDS[a]

Planning Area	Area Subject to Flooding	Average Annual Flood Damages 1975	1985	2000
	Thousand Acres	Thousand Dollars		
Upper Yellowstone	150.3	2,315	2,650	3,444
Tributaries	63.6	1,461	1,753	2,484
Main Stems	86.7	854	897	960
Clarks Fork-Bighorn	48.7	260	293	367
Tributaries	23.1	128	154	218
Main Stems	25.6	132	139	149
Tongue-Powder	116.8	637	680	760
Tributaries	28.1	74	89	126
Main Stems	88.7	563	591	634
Lower Yellowstone	171.6	1,045	1,158	1,413
Tributaries	84.1	414	496	704
Main Stems	87.5	631	662	709
North Dakota Tributaries	415.3	2,412	2,733	3,483
Tributaries	251.3	1,337	1,605	2,273
Main Stems	164.0	1,075	1,128	1,210
Wind-Bighorn-Clarks Fork	132.5	1,307	1,446	1,753
Tributaries	62.8	490	588	833
Main Stems	69.7	817	858	920
Northeast Wyoming	107.3	1,077	1,240	1,631
Tributaries	57.3	732	878	1,245
Main Stems	50.0	345	362	386
Study Area	1,142.5	9,053	10,200	12,851
Tributaries	570.3	4,636	5,563	7,883
Main Stems	572.2	4,417	4,637	4,968

a/ Updated from Missouri River Basin Framework Study estimates, with interpolations and price indexing for 1975 plus new projections for 1985 and 2000

Streambank erosion damage estimates are shown in table 25 with sources and constraints in distribution by planning areas as indicated by footnotes.

Table 25
CURRENT AND PROJECTED STREAMBANK EROSION CONTROL NEEDS[a]

Planning Area or Combinations[b]	Total Length of Channel	Length of Erosion Current Total	Serious	Average Annual Damages 1975	1985	2000
	Stream Miles	Bank Miles		--- Thousand Dollars ---		
Upper and Lower Yellowstone, Mont.						
Main Stems	671	105	21	217	338	382
Major Tributaries	767	132	15	85	133	150
Clarks Fork-Bighorn, Mont.[b]						
Main Stems	454	81	10	80	125	141
Tongue-Powder, Mont.						
Main Stems[b]	1,043	215	21	119	186	209
Yellowstone, Clarks Fork-Bighorn, Tongue-Powder River Tributary Areas, Mont.	47,250	1,028	488	61	96	108
Little Missouri River Tributaries, Mont.	4,702	330	48	8	12	14
North Dakota Tributaries						
Tributaries	25,299	296	296	39	55	62
Main Stems	1,891	362	38	265	369	419
Wind-Bighorn-Clarks Fork, Wyo.[b]						
Tributaries	19,447	1,989	844	107	166	187
Main Stems	1,294	213	29	243	377	426
Northeast Wyoming[b]						
Tributaries	33,085	3,573	1,548	220	343	388
Main Stems	665	142	15	76	116	132
Study Area	136,568	8,466	3,373	1,520	2,316	2,618
Tributaries	129,783	7,216	3,224	435	672	759
Main Stems and Major Tributaries	6,785	1,250	149	1,085	1,644	1,859

a/ Based on data in Western United States Water Plan (Westwide Study) and National Streambank Erosion Assessment of 1969, adjusted to 1975 conditions

b/ Ad Hoc Group estimates for entire rivers distributed to planning areas based on judgment of State planning team.

Indian Water Requirements

Forecasting Indian water requirements is complex and difficult in view of current limitations on the use of available resource data and because of varied interpretations read from treaties and agreements between Indian tribes and the United States as approved by acts of Congress or formalized by executive orders. To understand the basic tenets it is necessary to examine the Federal reservation system or doctrine. In its simplest form, this doctrine means that if the U.S. Government reserves a portion of the public domain for a Federal use which ultimately will require water, and intends to reserve unappropriated water for that purpose, then sufficient amounts for that use are reserved from appropriation by private users.

The effect of the doctrine is twofold: (1) when the water is eventually put to use, the water rights of the United States will be superior to private water rights which were acquired after the date of the reservation; and (2) the Federal use is not subject to State laws regulating the appropriation and use of water. The origin of the doctrine was the U.S. Supreme Court decision in the case of United States v. Rio Grande Dam and Irrigation Company, 174 U.S. 680 (1899).

With respect to Indian water rights, a similar form of the reservation doctrine has been set forth. It had its beginning in 1908 in the case of Winters v. United States, 207 U.S. 564 (1908), which maintains that the formation of an Indian reservation necessarily reserved the water without which the lands would have no value. This decision has become known as the Winters Doctrine and has served as the keystone upon which virtually all Indian water rights cases have been based.

Given a broad interpretation, the Winters Doctrine would appear to assign an unlimited amount of water for use on Indian reservations. However, most of the related case law has held that the quantity of the right is to be measured by the amount required for irrigation of all lands within the reservation that can be irrigated practically. In Arizona v. California, 373 U.S. 546 (1963), the amount of water reserved for Indian use was determined by using Bureau of Reclamation standards for measurement of water requirements for irrigable lands. It is necessary to note that while this ruling appears to fix irrigation potential as the measure of all Indian water rights, there is no definitive ruling to that effect. Also, it cannot be stated with accuracy whether uses for recreation, industry, or energy-related development may be considered as a portion of the irrigation water allotment simply as a change of use from the original purpose, or whether nonirrigation developments entitle the Indians to additional amounts of water above those needed for irrigation purposes.

Litigation concerning Indian water rights is currently pending in Federal District Court in Billings, Mont. Of three lawsuits pending, two actions were brought by the United States on its own behalf and on behalf of the Crow and Northern Cheyenne Indian tribes to have the water rights adjudicated in the Tongue and Bighorn River drainages. The third suit, brought by the Northern Cheyenne tribe on its own behalf, is to adjudicate the water rights in the Tongue River and Rosebud Creek. There are a few thousand private water users and several State agencies named as defendants in the three lawsuits.

These actions have not yet gone to trial, and it is unlikely that they will go to trial in the near future. Motions to dismiss were filed by the State and most of the private users in September 1977. These motions argue generally that the proper forum for adjudication of all of these water rights—Federal, Indian, and private—is in Montana district courts pursuant to the Montana Water

Use Act. Until this basic jurisdictional question is finally resolved, there will be no further action in these cases.

Pursuant to an act of the State legislature, the State of Wyoming January 24, 1977, instituted a general adjudication of the nature, extent, and relative priority of the water rights of all persons in the Bighorn River System and all other sources of water in Water Division Number Three, which includes the Wind-Bighorn-Clarks Fork area. The United States has been joined in this adjudication in both its proprietary capacity with respect to such things as national forests and in its fiduciary or trustee capacity for and on behalf of the Shoshone and Arapahoe Indian tribes of the Wind River Reservation. In the adjudication, the court is being asked to (1) confirm those rights of evidence by previous court decrees, by certificates of appropriation, or by certificates of construction heretofore issued by the Wyoming State Board of Control; (2) determine the status of all uncanceled permits to acquire the right to the use of the water of the State of Wyoming and adjudicate all perfected rights thereunder not heretofore adjudicated; (3) determine the extent and priority date of and adjudicate any interest in the right to use the water of the Bighorn River System and all sources in Water Division Number Three not otherwise represented by the aforementioned certificates or permits; and (4) establish, in whatever form determined to be most appropriate by the court, one or more tabulations or lists of all water rights and their relative priorities on all sources in Water Division Number Three. Since tens of thousands of permits and rights are involved, and inasmuch as the case may be a precedent-setting one with respect to the reservation doctrine, it will undoubtedly be several years before the case is settled.

The importance of these actions in Wyoming and Montana is substantial since—whether they are tried in State or Federal court—they could answer the question of the extent of Federal and Indian reserved water rights in the Yellowstone River Basin. The adjudicating court will have to determine the reserved water rights, and it may also determine such important questions as whether the Indian right is ultimately quantifiable, or, as the Indians have claimed, open-ended, and whether the reserved waters can be used or sold for use outside the boundaries of the reservations. In view of the complexity of the pending procedural issues, however, these questions will not soon be answered.

Because of these uncertainties and the current activities in the legislatures and courts to resolve the problems, it is very difficult to make predictions of what may happen with respect to Indian water developments. For purposes of this study it was considered that water and related development needs on the reservations should be treated in the same manner as for those off-reservation, i.e., comprising a part of the overall needs for agricultural and mineral production, satisfaction of fish/wildlife and recreation requirements, fulfilling municipal and domestic water requirements, etc. Likewise, in the absence of firm plans for imminent developments on the reservations, it is assumed for purposes of this analysis that there will be no further resource development on the reservations through the year 2000 without Federal assistance.

Fish and Wildlife

Under the Federal Fish and Wildlife Coordination Act, conservation of these resources is to receive equal consideration with other functions of water resource management. For the most part, controversies develop from inadequate knowledge of the effects of various proposals on area resources. With certain exceptions, the data base for fish and wildlife resources as compared with water resource data is quite limited as are the

methodologies for projecting the possible effects on fish and wildlife from various proposed actions. Thus, the greatest problem and need is to complete basic inventories of both habitat and populations, to complete basic research now underway, and to develop adequate technologies by which to project the basic fish/wildlife needs and the impacts of interacting resource proposals.

Inputs for the fish and wildlife function in this study have not been such as to permit a comprehensive, uniform portrayal of existing problems and projected needs, as has been possible for most other functions. Under these circumstances the available information by States is as follows:

Montana

Montana Department of Fish and Game's strategic plan indicates a surplus of salmonoid, nonsalmonoid, waterfowl, and grouse populations will exist in the Yellowstone Basin planning area through 1982; big game, pheasant, and turkey populations are presently being managed to adjust a limited supply to a greater demand. In addition, the demand for trout fishing in streams will exceed presently available supply by 1990. Without solving problems of access to private lands and through private lands to public lands and without solving problems of increasing habitat degradation, the supply of wildlife and fish will not increase in proportion to demands over the long term.

In general, the future "without" plan is affected by four factors: (1) continuing degradation and loss of habitat; (2) lack of adequate access; (3) a relatively fixed supply; and (4) increasing demand. It is unlikely that the private sector will enter the fish and wildlife business in any substantial way until shortages become apparent and encourage profitable entry. Loss and degradation of habitat as well as limited access for sportsmen have to be accounted for; thus, maintenance of habitat and access must be recognized as a shortage and a remaining need.

Waterfowl hunting is available in adequate supply basinwide, but a demand for waterfowl hunting within 50 miles of Billings is an expressed need, especially since the moratorium on hunting on the Crow Indian Reservation. Other generally recognized needs are: (1) actions by the Montana Board of Natural Resources on requests for instream flow reservations; (2) establishment of several new waterfowl breeding and resting areas; (3) arrangement for fish passage at critical diversion structures; and (4) augmentation of low streamflows to improve habitat in streams where depletions are adversely affecting aquatic life.

North Dakota

Currently instream flows are not recognized as a beneficial use in North Dakota, and under the "without" conditions it is expected that instream flows would not be established or protected and would continue to decline. From the standpoint of fish and wildlife objectives, the foremost needs are for (1) environmental legislation at the State level according such recognition, (2) identification of critical aquatic and wildlife habitats, and (3) determination and implementation of plans to manage these resources for the general well-being of the State. Considering the wide variation in flow characteristics and degree of present streamflow utilization and residuals, there is need to develop a methodology that lends itself to a variety of existing constraints and meaningful objectives in sustaining aquatic life.

Under existing conditions, some 3,500 acres of unique woodland are protected under Federal ownership and about 7,300 acres are held in private ownership. For the private areas there is need for easements for their protection. Although the planning area has 10 national wildlife management areas, and there are other lands adjacent to some of these that may have potentials for addition to the protection area system, the needs have not been quantified in this study.

Wyoming

The Wyoming Game and Fish Department has established objectives for meeting the State's wildlife and fishing needs for districts approximating the Wind-Bighorn-Clarks Fork and Northeast planning areas, with regional and State projection periods and results as shown in table 26. State objectives for 1980-1990 for game do not necessarily represent specific future objectives for the planning areas. In all species hunted and for both stream and lake/reservoir fishing, these figures show the need and objectives for increased production and harvest. Virtually all streams have a carrying capacity that exceeds their use, even though some of them are subjected to heavy fishing pressure. Generally there are recognized needs to enact legislation acknowledging fish, wildlife, and the general environment as contributing to general well-being, to identify and preserve

Table 26
FISH AND WILDLIFE OBJECTIVES[a]
WIND-BIGHORN-CLARKS FORK AND NORTHEAST WYOMING PLANNING AREAS, AND STATE OF WYOMING

	1980 Objectives for Wyoming Planning Areas			Statewide Projected Change 1980-1990		
Species	Postseason Population WBC[b]/NEW[b]	Harvest WBC[b]/NEW[b]	Recreation Days WBC[b]/NEW[b]	Post-season Population	Harvest	Recreation Days
	Big Game			(%)	(%)	(%)
Antelope	14,600/79,090	3,150/22,712	6,930/49,966	-1	-2	+24
Mule Deer	61,600/103,730	13,875/25,919	83,250/155,514	+15	+23	+34
Whitetail Deer	700/45,450	50/14,137	275/79,753	-17	-14	+22
Elk	17,820/6,075	4,565/1,733	68,475/25,995	+2	+3	+17
Moose	950/60	115/5	460/20	0	0	0
Bighorn Sheep	1,900/175	88/4	2,640/120	+9	+20	+20
Mountain Goat	80/-	4/-	16/-	+25	+50	+50
Black Bear	475/333	70/47	2,800/1,880	0	+8	+8
Grizzly Bear	100/-	5/-	200/-	+40	+100	+100
	Small Game					
Cottontail	37,000/50,833	NA	18,500/25,417	NA	+40	+40
Squirrel	429/756	NA	286/504	NA	+39	+39
Snowshoe	250/1,095	NA	250/1,095	NA	+46	+46
Pheasant	5,650/4,884	NA	8,071/6,977	NA	-18	+22
Sage Grouse	8,600/5,146	NA	5,058/3,027	NA	0	+71
Sharptail	-/3,643	NA	-/3,036	NA	—	—
Partridge	7,100/1,372	NA	8,875/1,716	NA	+56	+56
Mountain Grouse	2,600/2,710	NA	2,600/2,710	NA	+83	+83
Turkey	12/2,158	NA	40/7,194	NA	+25	+25
Ducks	40,972/22,971	NA	27,314/15,314	NA	+40	+40
Geese	2,009/919	NA	10,045/4,595	NA	+180	+180

	Thousand Fisherman-Days			
	1980	1985	1990	2000
Streams	405/201	438/253	476/272	575/NA
Lakes and Reservoirs[b]	418/232[c]	452/292[c]	492/315[c]	575/NA
Total	823/433	890/545	968/587	1,000/NA

a/ Wyoming Game and Fish Department
b/ WBC = Wind-Bighorn-Clarks Fork Planning Area, NEW = Northeast Wyoming Planning Area.
c/ Majority of fishing pressure—Keyhole Reservoir and Lake DeSmet.

critical habitat; to emphasize the inclusion of fish and wildlife enhancement in project plans; and to strengthen the policy and funding in acquiring public access to streams where significant requirements therefore become apparent.

Other stated objectives are: (1) for furbearer species, to determine population status and harvest potential; (2) for raptors, nongame birds, and mammals, to initiate/maintain status/inventory and estimate recreational/esthetic importance; and (3) for endangered and threatened terrestrial wildlife, to determine population density and take steps to insure their continued maintenance or increased production.

Endangered Species

Under provisions of the Endangered Species Act (P.L. 93-205) two categories of endangerment were recognized: (1) those species in danger of extinction, and (2) those species likely to become endangered within the foreseeable future—both throughout all or a significant portion of their ranges. Two primary objectives were to "provide a means whereby the ecosystem upon which endangered species and threatened species depend may be conserved," and "to provide a program for the conservation of such endangered species and threatened species." The act placed a heavy responsibility on all Federal agencies and especially on the Secretary of the Interior for its administration. The Secretary has delegated to the Fish and Wildlife Service responsibility for coordinating programs to this end. Recovery plans developed by recovery teams reflect the ultimate goal of restoring endangered and threatened species as viable self-sustaining members of their ecosystems.

Animal species on the Federal endangered list known to occur within the study area and to occupy local habitat include the black-footed ferret, Rocky Mountain wolf, bald eagle, and the American peregrine falcon.

Migratory Birds

Migratory birds frequenting the study area are renewable resources that provide recreation in various forms for thousands of people. However, the resource is not limitless, and, thus, careful surveillance and management are needed to keep populations in harmony with other land and water uses. As the Federal agency having primary responsibility for the overall welfare of migratory birds under the Migratory Bird Treaty Act[4], the U.S. Fish and Wildlife Service must perpetuate the resource through wise use and sound management. This must be accomplished through extensive cooperative efforts with the States, Canadian and Mexican natural resource agencies, and the private sector. Recognizing the wide variety and heavy populations of ducks, geese, shore birds, cranes, and other forms that pass through the study area to and from nesting and wintering grounds, the Service (and States) has acquired and must preserve and increase natural habitat generally as practicable and within national wildlife refuges and wetland management districts.

---

[4] Also "Migratory Bird Conservation Act, Migratory Bird Hunting Stamp Act, and Convention Agreement between the United States and United Mexican States for the Protection of Migratory Birds and Game Mammals."

Outdoor Recreation

Despite the existence of large tracts of land, areas of water, and miles of rivers and streams, the development of outdoor recreation facilities and acquisition of accesses have fallen behind public demands in many parts of the study area. Private recreation has provided and will continue to provide a portion of the public recreation needs. However, without a coordinated commitment by all interests to provide recreational opportunities for an expanding population, the inadequacy of development and access will be magnified.

Outdoor recreation in the area has covered a broad spectrum of human activity throughout the years, ranging from a variety of summer activities to a rapidly increasing demand for winter sports. This, along with the interests of a diverse population which is increasing in mobility and possesses abundant leisure time, must be considered in assessing the recreational problems and needs. Given the natural attractions of the area for the local population and an already heavy and growing presence of nonresident visitors not only during the summers but expanding to the winter seasons, the evolving problems and needs require more attention to coordinated planning and sound resource development, preservation, and management.

Time and funding restrictions limited the collection of data on potential historic, scenic, and natural outdoor recreation resources (type I). In view of the rapidly growing public support for the preservation of these resources, the need exists for affected State and Federal agencies to inventory and evaluate the historic, scenic, and natural recreation resources and to develop plans for their preservation. Such inventory should also include potential rivers to be protected, as well as scenic and recreational trails. This program, with assistance from the public and nonprofit organizations, will provide a means of preserving these nonrenewable resources for the enjoyment of future generations.

Many facilities and resources inventoried that provide for land- and water-oriented recreation (types II and III) either are far removed from the current or potential user or inadequate when compared with the most probable level of demand for the area as a whole. There are many variations between planning areas and within each of them.

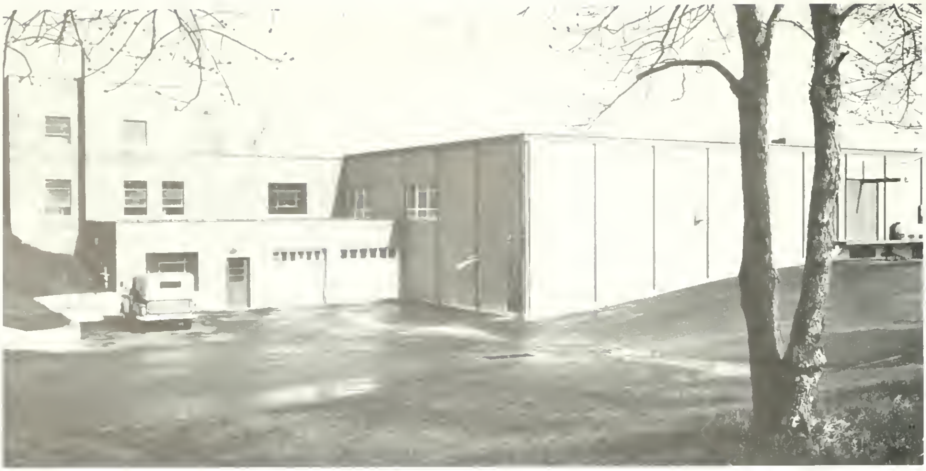
In appraising outdoor recreation needs for land- and water-oriented activities, the methodology for developing demand was based on estimated 1975 and future populations. Anticipated participation rates were multiplied by the population estimates for a given target year to arrive at estimated activity occasions which were converted to recreation days. The total acreage required to support future recreation demand was derived using design load from State Comprehensive Outdoor Recreation Plans (SCORP) or previous river basin planning studies. Acreage estimates were calculated for both land and water for all activities (swimming beach, water and snow skiing, boating/canoeing, etc.). Comparison of these estimates with the available supply, provided a means of determining surplus or deficit resources in each planning area. Quantitative needs for driving and sightseeing were not derived since there are no measurable standards for this popular activity.

The deficits (-) and surpluses (+) as shown in table 27 for the several recreation activities focus on inadequacy or adequacy by planning area. Although it would appear that some balancing of

Table 27
DEFICIT OR SURPLUS OF OUTDOOR RECREATION WATER AND LAND[a] [b]

Planning Area	Swimming Beach W/L (Acres)	Water Skiing W/L (Acres)	Fishing (Fishing Days)	Picknick-ing L (Acres)	Nature Walks L (Acres)	Boating and Conoeing W/L (Acres)	Hunting (Hunting Days)	Camping L (Acres)	Hiking L (Acres)	Games Sports L (Acres)	Winter Sports (IS)/(SS) (Acres)
1975											
Upper Yellowstone	-18/-40	-3,495/-13		-269	-432	-2,523/-47		-321	-422	-170	-6/-20
Clarks Fork-Bighorn	1/2	-152/-1	+192,816	51	-16	401/8	+164,000[k]	122	-12	-6	-1/-2
Tongue-Powder	-1/-1	-425/-2		-6	-13	-307/-6		4	-7	-4	-1/-1
Lower Yellowstone	-8/-17	-1,443/-5		-98	-179	-1,042/-19		-176	-174	-70	-2/-8
North Dakota Tributaries	-6/-12	233,535/0		657	NA	233,685/NA	NA	608	123	1,620	1,101,286/NA
Wind-Bighorn-Clarks Fork	NA	69,574/123,931		51	-	71,216/123,918		18,988	NA	672[e]	NA
Northeast Wyoming	NA	26,206/14,183		310	NA	27,131/14,138		3,358	NA	6,882	NA
Study Area	-32/-68	323,800/138,093		696	-640	328,561/137,992		22,583	-615[h]	8,924	1,101,276/-31
1985											
Upper Yellowstone	-24/-53	-4,477/-17		-382	-577	-3,409/-63		-529	-547	-235	-7/-25
Clarks Fork-Bighorn	1/2	-282/-1	+5,833	49	-22	281/5	+17,400[k]	118	-15	-8	-1/-2
Tongue-Powder	-1/-1	-677/-3		-12	-22	-515/-9		-4	-12	-7	-1/-2
Lower Yellowstone	-10/-21	-1,752/-7		-135	-226	-1,334/-25		-247	-214	-92	-3/-10
North Dakota Tributaries	-12/-26	231,740/0	NA	606	NA	232,650/NA	NA	305	99	1,547	1,101,279/NA
Wind-Bighorn-Clarks Fork	NA	68,591/123,927	-57,000	7	NA	69,600/123,890	-140,000	18718	NA	667[e]	NA
Northeast Wyoming	NA	25,121/14,180	-130,000	288	NA	26,217/14,120	-17,000	3,208	NA	6,869	NA
Study Area	-46/-99	318,264/138,079	-181,167	421	-847	323,490/137,918	-139,600	21,569	-788[h]	8,741	1,101,267/-39
2000											
Upper Yellowstone	-27/-59	-5,473/-20		-517	-742	-4,453/-82		-789	-680	-315	-8/-30
Clarks Fork-Bighorn	1/2	-495/-2	-373,127[j]	45	-30	72/2	-283,900[k]	110	-21	-11	-1/-3
Tongue-Powder	-2/-3	-1,512/-6		-33	-51	-1,230/-23		-32	-26	-16	-2/-6
Lower Yellowstone	-11/-25	-2,293/-9		-203	-311	-1,865/-34		-376	-285	-132	-4/-13
North Dakota Tributaries	-24/-54	227,612/0	NA	498	NA	231,052/NA	NA	-134	43	1,383	1,101,264/NA
Wind-Bighorn-Clarks Fork	-3/-3	66,952/123,921[c]	-162,000	-66	NA	68,432/123,869[d]	-305,000	18,000	NA	655[e]	NA
Northeast Wyoming	-5/-5	23,314/14,173	-185,000	253	NA	24,694/14,093[f]	-87,000	2,958	NA	6,847	[g]
Study Area	-71/-147	308,105/138,057	-720,127	-23	-1,134	316,702/137,825	-675,900	20,005	-1,012[h]	8,411	1,101,249/-52

a/ W = Water Surface, L = Land Surface, IS = Ice Surface, and SS = Snow Surface
b/ NA = No State Standards provided—thus, estimates are not available, also for driving/sightseeing, which have not been included.
c/ 9 ramps only needed year 2000
d/ 20 ramps needed year 2000.
e/ However, 227 needed in 1976, 308 in 1985, and 454 in 2000.
f/ 25 ramps only needed year 2000.
g/ Expand ski areas in year 2000
h/ Exclusive of North Dakota Tributaries surplus
j/ A deficit in trout fishing in streams is offset by an abundance of lake fishing and nonsalmonoid fishing
k/ A surplus of supply over demand for all types of hunting masks shortages of supply in big game hunting



deficits and surpluses between and within planning areas is possible, excessive travel distance often precludes this. For example, the water surplus shown in Wyoming will not accommodate day-use needs of the Montana recreationist due to the excessive driving distance. Another factor that cannot be overlooked is the supply/demand imbalance within the individual planning areas. For example, a surplus of water for water skiing is shown in the North Dakota tributaries planning area; this total consists primarily of Lake Sakakawea along the very northern edge of the planning area. Here, due to excessive distances, this large supply of water does not meet the day-use requirements of residents of southwestern North Dakota. Adding to the problem of inadequate geographical identification of recreational needs is the lack of uniform planning standards for determining uses and projecting needs.

Although water resources abound in the area generally, their recreation potential is, in fact, limited by the prospective industrial and agricultural demands for water and by insufficient access to major rivers. The major needs are maintenance of adequate and quality instream flows and the acquisition of public access sites. The increasing closure of private lands to recreation will inevitably place more and more pressure on public lands.

Many recreation facilities are dependent on or directly related to reservoirs, large or small, or other project features developed primarily for some other purpose than recreation. Because these projects and attendant features generally involve State or Federal funding, it is assumed that these recreational facilities will not be available under "without" conditions. Needs that will be met otherwise are essentially those associated with local problems and existing facilities; thus the deficits set forth in table 27 must be considered as needs along with other needs that may be identified in more detailed studies.

Water Quality Control

In considering problems and needs for water quality control and instream flows, the following quotation from the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500, Sec. 101) serves as the cornerstone for water quality goals:

The objective of this act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. More specific objectives include: (1) It is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985; (2) it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the waters be achieved by July 1, 1985.

Each of the three States of the study area has adopted statements of its water quality objectives.

The following example was taken from Wyoming's Water Quality Rules and Regulations (1974):

The goal of the water pollution control program is to maintain the best possible quality of water commensurate with use. All sources of pollution, whether man-made or natural, shall be considered. Control shall be applied to all sources where physically and economically feasible. By the nature of the problems, they will evolve into long-range and short-range programs to reach the ultimate goal. Definition of such problems and control programs will be a part of the State continuing planning process.

Fully recognizing the wide-ranging but specific application of Federal and State water quality objectives and adopted standards for this study it was necessary to devise a simple, practical approach in developing a baseline to judge present conditions (1975) and conditions anticipated in imposing future resource proposals. Basic to this, an ad hoc group updated available 1970 data to reflect water quantity and quality for streamflows depleted to 1970 conditions. Using computer analyses for 17 locations, the group's report shows monthly adjusted values for 5 quality parameters where the minimum and maximum predicted chemical concentrations are as shown in table 28. Such values were based on 5 years of records to attain equations using a linear relationship between chemical concentrations and flows.

Although generally the quality of the waters is good and new treatment plants already or soon will control pollution from point sources, at some

Table 28
PREDICTED RANGE OF WATER QUALITY UNDER 1975 CONDITIONS OF DEPLETED FLOW[a]

River and Location	Predicted Range of Average Monthly Values (Min.-Max.) TDS	Sodium	Calcium	Magnesium	Sulfate
	Mg/liter				
Wind below Boysen Reservoir, Wyo.	433-459	61-65	56-58	18-19	201-210
Greybull at Basin, Wyo.	366-633	67-113	46-71	16-31	178-293
Shoshone at Lovell, Wyo.	405-578	55-79	54-76	16-24	163-247
Bighorn at St. Xavier, Mont.[b]		—	—	—	—
Tongue near Miles City, Mont.[b]		—	—	—	—
Powder at Arvada, Wyo.	1,066-1,903	149-369	143-162	35-64	566-885
Powder at Moorhead, Mont.[b]		—	—	—	—
Powder at Locate, Mont.[b]	1,047-1,560	—	—	—	—
Little Missouri at Watford City, N. Dak.	<294-1,638	57-378	14-93	10-45	135-810
Knife at Hazen, N Dak.	483-1,113	96-251	38-78	17-44	184-457
Heart at Mandan, N. Dak.	597-787	111-153	48-60	27-36	237-346
Cannonball at Breien, N. Dak.	800-1,879	42-267	<52-111	<43-88	<452-970
Belle Fourche at Wyoming-South Dakota Line	419-1,606	<42-109	70-264	12-83	226-998
Cheyenne at Edgemont, S. Dak. (Upstream of Angostura Res.)	3,139-3,139	392-392	358-358	107-107	1,514-1,514
Yellowstone at Billings, Mont.[b]	116-321	—	—	—	—
Yellowstone at Miles City, Mont.[b]	353-586	—	—	—	—
Yellowstone at Sidney, Mont.[b]	304-602	—	—	—	—
Public Water Supply Standard[c]	500	—	—	—	50/250
Irrigation Standard[c]	500/1,500	—	—	—	—
Livestock Standard[c]	1,000/7,000	>1,000/2,000	>500/1,000	>250/500	>250/1,000

a/ Ad Hoc Committee Report, "Develop 1975 Surface Water Quality Data."
b/ Montana Water Quality Bureau—financed by Old West Regional Commission.
c/ Range in "Standard" generally recognized for the indicated uses

locations the present water quality is marginal or below recognized standards. For the "without" situation it is assumed that all communities and other point sources of water pollution will provide satisfactory treatment by 1985. Irrigation, feedlots, grazing or range lands, certain new industrial developments, and even natural as well as man-induced contributions of sediment show complex problems. Satisfactory solutions for these problems will evolve only over time as water quality administrators and operators seek their practical implementation.

An original study concept of determining instream flow requirements to meet NED constraints proved unrealistic because (1) State water quality standards are not generally defined well enough to relate directly to stream discharge; (2) the data base is not complete, for many stream segments show inadequate or no data; and (3) the lack of fixed relationships regarding water quality variables where many of these may be strongly affected by other external factors. Thus, the ad hoc group on instream flows narrowed the scope of its activities to examine but one variable that has a direct and relatively stable relationship with flows—total dissolved solids (TDS). About 5 years of records were used to define regression curves for selected stream locations over the study area. Figure 14 illustrates the results in this respect for the Shoshone River near Lovell, Wyo., where the curve related TDS to discharge and the 500 ppm standard. Such curves were developed for about 15 stations.

Instream Flow

With the objective of maintaining the high quality environment in and adjacent to the principal rivers and their tributaries, the ad hoc group developed a set of recommended monthly average flows that would reasonably assure this. These estimates took into account the physical/biological requirements including adequate spawning and rearing conditions, migratory movements of fish, maintaining sediment transport and bedload movement, etc. While the estimates were developed for 86 locations as shown in the planning area reports for these streams, it is not practical to show all of them here. Instead, table 29 shows the results only for those locations involved in determinations of future quantity/quality impacts under river and reservoir system operation studies.

Figure 14
Shoshone River Near Lovell, Wyoming
(Bighorn River Basin)

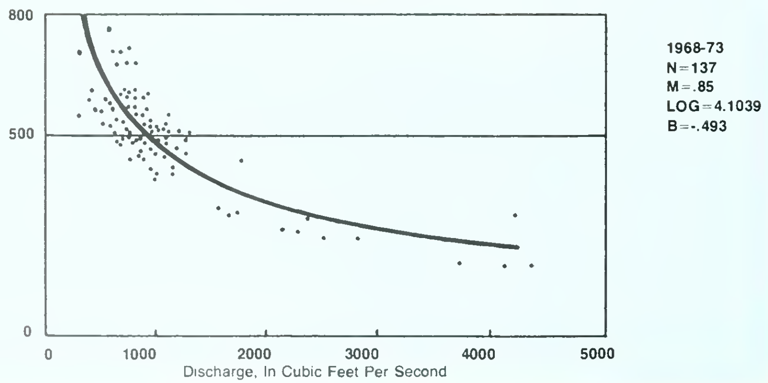


Table 29
ESTIMATED INSTREAM FLOW NEEDS TO ASSURE HIGH QUALITY ENVIRONMENT[a]
(SELECTED LOCATIONS OVER THE STUDY AREA)

River Station or Reach	Needed Flow for Month or Interval											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	Second-Feet											
Wind R. Below Boysen Res., Wyo.	750	750	750	750	1,000	1,050	1,050	1,050	1,050	775	750	750
Wind R. Above Yellowtail Res., Wyo.	1,000	1,000	1,000	1,000	1,200	1,450	700	700	800	1,000	1,000	1,000
Bighorn R., Yellowtail Res. to Mouth, Mont.	3,300	3,200	4,000	3,600	3,800	5,200	3,800/3,200	2,800	2,600	2,700	3,100	3,200
Tongue R., Wyo.-Mont. Line to Tongue Res. Mont.	160	160	200	200/300	700/1,200	1,350	360	100	100	200	200	150
Tongue R., Tongue Res. to Mouth, Wyo.	125/135	125/135	190/200	200/230	425/900	800/900	370	100/300	100/200	100/155	100/120	135/145
Powder R., Wyo.-Mont. Line to Little Powder	100	100	400	400	600	750	120	30[b]	30[b]	100	100	100
Powder R., Little Missouri to Mouth, Wyo.	80	80	500	500	800	800	200	40[b]	40[b]	80[b]	80	80
Little Missouri R. at Watford City, N. Dak.	1	187	939	470	299	583	270	122	59	68	28	8
Knife R. at Hazen, N Dak.	16	51	316	222	53	167	73	28	25	26	27	19
Heart R. at Mandan, N. Dak.	13	23	283	243	71	105	76	77	65	55	42	25
Cannonball R. at Mandan, N. Dak	6	39	313	233	129	236	90	25	15	16	18	11
Clarks Fork R., Blue Water Cr. Mouth, Mont.	250	240	240	390	1,070	2,900	1,400	470	400	400	330	260
Yellowstone R., Clarks Fork to Bighorn R., Mont.	2,200	2,200	2,600	3,000	6,000 to 12,500	20,300 to 6,000	11,500	3,800	3,000	3,000	3,000	2,200
Yellowstone R., Mouth Bighorn R. to Mouth Powder R., Mont. (Miles City)	4,800	5,500	11,000	11,000	11,000 to 17,000	25,000 to 42,000	17,000 to 9,000	7,000	7,000	7,000	7,000	5,600
Yellowstone R., Mouth Powder R. to Mont.-N. Dak. State Line (Sidney)	4,900	5,900	11,000	11,000	11,000 to 20,000	26,000 to 45,000	20,000 to 10,000	7,000	7,000	7,000	7,000	5,700

a/ Bases for estimates vary and are explained in planning area reports and Instream Flow Ad Hoc Group Report.

b/ Weighted average—see remarks, table 2a, Northern Great Plains Resource Program Instream Needs Subgroup Report, Work Group C, WATER - May 1974

CHAPTER 5

WATER AND RELATED LAND RESOURCE POTENTIALS

Institutional Framework

Existing Federal and State laws, policies, and the administration practices of a variety of governmental agencies profoundly affect the present and future use of water and land resources. Before plans can be developed, it is necessary to recognize those constraints to planning contained in the existing laws, policies, and administrative procedures.

In order to prevent abuse by those who do not concern themselves with prudent management of our available resources, laws are passed and administrative restrictions are issued to authorize or to regulate the use of resources. These legal and institutional regulations can facilitate or constrain the development and use of resources. Since there is no single and certainly no universally acceptable definition of what constitutes "the total public good," society has attempted to protect it by piecemeal actions that attempt to control resource segments where some measure of the public interest can be identified. Some of the more significant of the institutional and legal constraints that affect the future of the Yellowstone level B study area are summarized briefly in the following paragraphs. These constraints apply to all types of development—private and public—and do affect what will happen, either with or without coordinated planning efforts.

Federal Legal Constraints

Navigable Waterways

Uses of, discharges in, or intrusions in, navigable waterways require a permit from the Corps of Engineers according to section 10, Act of March 3, 1899. The Corps of Engineers has declared the Yellowstone River navigable to Emigrant, which is 21 miles upstream from Livingston, Mont. The United States District Court has found the Bighorn River navigable up to the Montana-Wyoming border.

Land Limitations

Irrigable lands to which irrigation water from a Federal reclamation project can be delivered are generally limited to 160 acres in the ownership of a single person or entity or 320 acres in the ownership of husband and wife (Act of June 17, 1902, as amended and supplemented). There are, however, many legal exceptions.

Winters Doctrine

Lands within an Indian reservation or other Federal areas reserved for public purposes hold a reserved right to use the waters which are within, crossing, abutting, or beneath the reservation. This reserved right, even though unexercised, en-

joys a continuing priority as of the date the reservation was established. The quantity of the reserved right is that amount of water needed to serve the purposes for which the reservation was established.

The Federal Power Act of 1920, as amended, requires non-Federal entities who propose to construct a power or navigation facility to secure a Federal Regulatory Commission license prior to any construction which will affect (a) waters over which Congress has jurisdiction; or (b) public lands or reservations of the United States.

The Fish and Wildlife Coordination Act, as amended, requires that any public or private agency, proposing to impound or divert water or to modify any stream, must consult with the Fish and Wildlife Service and take appropriate action to prevent loss or damage to fish and wildlife resources.

The Yellowstone River Compact provides for the division of waters of the Yellowstone River drainage area between Wyoming and Montana and Montana and North Dakota and forbids the diversion of waters from the Yellowstone River Basin without the unanimous consent of Wyoming, Montana, and North Dakota.

The Stock-Raising Homestead Act of 1916 provides for protection of crops and improvements of the surface owner against the developer of federally reserved minerals. The Act of June 21, 1949, extends this surface owner's protection to damage done to the value of the land for grazing.

The Federal Water Pollution Control Act Amendments of 1972 restate and extend previous Federal laws prohibiting the pollution of navigable waters. Standards for water quality and the enforcement of such standards are to be the responsibility of the Environmental Protection Agency in cooperation with the affected States.

The Clean Air Act, as amended, provides for the establishment and enforcement of air quality standards by the Environmental Protection Agency in cooperation with the affected States.

The National Environmental Policy Act of 1969 requires that where Federal funds or property are involved, the development of natural resources must be preceded by an analysis and weighing of the environmental impacts of such development.

The Wilderness Act of 1964 prohibits commercial enterprise and permanent roads within any wilderness area designated by the act. The Washake Wilderness Area within the Shoshone National Forest was so designated October 9, 1972.

The Presence of Historical or Archaeological Data within the site of any Federal or federally licensed or assisted activity may require that the activity be preceded by a survey by the Secretary of the Interior to determine if such data shall be recovered and preserved. Act of June 27, 1960, as amended.

The Endangered Species Act of 1973 requires that Federal agencies insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of endangered species or result in the destruction or modification of the habitat of such species.

The Surface Mining Control and Reclamation Act of 1977 imposes limitations on the surface mining of coal and other minerals, not only with respect to surface reclamation and surface owner's consent, but also with respect to areas which cannot be surface mined.

State Legal Constraints

The Wyoming Water Code provides a right to the use and control of any of the waters of the State. The right must be initiated through application to the State engineer.

The Wyoming Environmental Quality Act of 1973 established an Environmental Quality Council and a State Department of Environmental Quality with authority to promulgate and enforce rules for the control of air, water, and land pollution. The act also provides for limitations on mining operations and requires that such operations be pursuant to a permit from the administrator of the Land Quality Division of the Department of Environmental Quality.

The Wyoming Industrial Development Information and Siting Act of 1975 establishes an Industrial Siting Council with authority to issue permits required for the construction of electrical generating plants (100 megawatts or more), synthetic gas plants (100 million cubic feet per day), oil extraction plants (50,000 barrels per day), uranium enriching plants (500 lbs.); or any other industrial facility costing more than $50 million indexed.

The Wyoming Excise Tax Act on the Extraction of Minerals imposes a 2 percent tax on the value of the gross product of most extracted minerals and an additional 2 percent tax on the value of the gross product of extracted trona, coal, petroleum, natural gas, oil shale, or any other fossil fuel minerals. The 1977 session of the Wyoming Legislature amended the tax laws to increase the severance taxes on specified minerals. A total increase of 4.5 percent was added to the tax on coal, 3.5 percent to the tax on uranium, and 1.5 percent to the tax on trona. One and one-half percent of the tax on each mineral will go into a fund for construction and improvements on State buildings; 1 percent of the uranium tax will go to the permanent mineral trust fund and 1 percent to the general fund for State agency budgets, 1.5 percent of the coal tax will go toward the funding of water resource developments, 1 percent toward highways, and 0.5 percent to the permanent mineral trust fund. Thus, as of 1977, the total severance tax is 8.5 percent of gross product value for coal, 5.5 percent on uranium and trona, 4 percent on other fuels, and 2 percent on nonenergy minerals. In addition to the severance tax, Wyoming imposes an excise tax on coal extraction that amounted to 1.2 percent of the gross value of production in 1976, 1.6 percent in 1977, and will level off at 2 percent in 1978 and subsequent years until gross revenues total $120 million.

The Montana Water Use Act of 1973 provides that after July 1, 1973, a right to the use of Montana waters may be initiated only through application for a permit from the Montana Department of

Natural Resources and Conservation. The act stipulated that the use of water for slurry out of State was not a beneficial use.

The Montana Moratorium on Yellowstone River Appropriations was a 3-year moratorium established March 12, 1974, on Yellowstone River Basin appropriations which exceeded 20 cfs or for reservoir impoundments exceeding 14,000 acre-feet. Reservations were permitted by local and State agencies but not by the United States. The 1977 Montana Legislature extended the moratorium to December 31, 1977, and permitted reservations by the United States. The Montana Supreme Court extended the moratorium to June 30, 1978.

The Montana Environmental Policy Act of 1971 provides, similar to the National Environmental Protection Act, that State agency actions which may significantly affect the quality of human environment shall be preceded by an analysis and weighing of the environmental impact of such actions.

The Montana Major Facility Siting Act requires that a certificate of environmental compatibility and public need be issued by the Montana Department of Natural Resources and Conservation as a condition to the construction of facilities for the generation or transportation of electricity, gas, or liquid hydrocarbon; for the transport of water; for the enriching of uranium; for the conversion of coal; for the use of geothermal resources; or for *in situ* gasification of coal.

The Montana Floodway Management Act of 1971 provides that where the Department of Natural Resources and Conservation has delineated an area as a flood plain, the establishment thereon of artificial obstructions or nonconforming uses, shall be unlawful.

The Montana Water Pollution Act forbids the pollution of State waters and requires a permit from the Department of Health and Environmental Sciences for any activity which is likely to cause such pollution.

The Montana Air Pollution Act authorizes the Montana Department of Health and Environmental Sciences to establish and enforce air quality standards and to require permits for any facility that may contribute to air pollution.

The Montana Coal Severance Tax Act imposes a severance tax on each ton of coal produced in Montana. The tax is based on the coal's BTU value and is varied from the greater of 12 cents per ton or 20 percent of value to 40 cents per ton or 30 percent of value on surface-mined coal and from 5 cents per ton or 3 percent of value to 12 cents per ton or 4 percent of value on coal mined underground. Montana also continues its general property and net proceeds tax on other types of mine production.

The North Dakota Water Code provides that the right to the use and control of any of the waters of the State must be initiated through application to the State Engineer.

The North Dakota Environmental Law Enforcement Act of 1975 allows any State or local governmental agency or person to bring an action to enforce any North Dakota environmental statute, rule, or regulation and to recover damages for the violation of the same.

The North Dakota Energy Conversion and Transmission Facility Siting Act requires a Public Service Commission's Certificate of Site Compatibility as a condition to the construction of an energy conversion or transmission facility after January 1, 1976.

The North Dakota Air Pollution Control Act, as amended, requires a permit from the North Dakota Department of Health as a condition to the construction, modification, or use of any source of air contamination which the Department of Health may identify.

The North Dakota Water Pollution Control Act authorizes the State Department of Health to establish and enforce standards to maintain water quality and to require permits of any person whose activities may contribute to the deterioration of water quality.

The North Dakota Coal Severance Tax Act imposes an initial tax of 50 cents per ton (increasing with the wholesale price index) on all coal severed for sale or for industrial purposes.

The North Dakota Privilege Tax on Coal Conversion Facilities was also enacted in 1975. On electric generating plants the tax is at the rate of .25 mills on each kilowatt-hour produced. The tax on coal gasification plants is 10 cents on each 1,000 cubic feet of gas produced or 2.5 percent of gross receipts.

Potential for Meeting Needs

There are many possibilities for making better use of the Yellowstone study area's resources and many opportunities for providing better protection for these resources. Unfortunately, many of the potentials are expensive, and often there is not a strong consensus among local interests on what courses of action are in the best interest of the local area or the area at large. Development-oriented groups believe that the area needs the economic gains that full use of available resources would bring, and that the area can withstand the related environmental and social strains without undue difficulty. Antidevelopment groups take the opposing stand—that the area cannot shoulder the environmental and social costs of fuller development, and that future activities should be limited to as near present levels as possible. Each of many groups represents a minority point of view, but this does not imply that there is a midpoint where the opposing views converge into a majority stance. There is, however, a major group that believes limited development and use of the area's coal and other resources can be managed and controlled to the area's overall benefit, considering the economic, environmental, and social pluses and minuses that are involved.

Agriculture (Irrigation and Related Developments)

Although there is a relative abundance of water in the river systems overall, the availability of an assured, firm supply for potential developments is generally dependent upon storage. In considering potentials for increased agriculture, a review was made of earlier investigations by Federal and State agencies or districts for added surface water irrigation projects and related developments. Moreover, all other irrigable lands delineated during this study were evaluated.

Improved irrigation efficiencies could increase crop yields, and current efficiencies on existing developments could be increased by use of ditch linings, pipelines, sprinkler systems, reorganization of irrigation systems, and by supplying water to lands proportional to the crop consumptive-use rate. New or additional storage is needed on most streams to store spring runoff for release during the peak consumptive-use period (July and August) to permit more efficient use of available runoff. Sizeable acreages now having irrigation service are in need of supplemental water supplies to attain full production.

Energy Industry

There is no question that the study area has the coal reserves to meet whatever demands might be imposed upon it between now and the year 2000. It is likewise apparent that other physical needs associated with any reasonable level of energy demand, such as water, land, and construction materials, could be provided. It is felt, however, that there is a limit of production beyond which the area could not support without severe environmental and population impacts. At the outside, that limit is the "without plan" or "high" level of development outlined in the previous chapter. The State study teams agree that there is some lower level of development that would be preferable, but they do not uniformly agree on what that level should be. In weighing future potentials, it should be recognized that the resources, and thus the opportunities, are available to meet any level of production the market place and environmental and social tradeoffs may ultimately permit.

In considering planning constraints, one of the early proposals was that mining should not be permitted in alluvial valley floors, in riparian communities, in areas where the coal beds are major aquifers, in national or State monuments, and in other publicly restricted areas. These constraints were adopted by the management group and incorporated in the model runs, but it was found that there is so much coal lying below unrestricted areas that the total amount of coal that could be produced within the "high" level of need was not limited by those constraints. Thus, the so-called "limited-mining" objective is a matter of controlling where and how coal is mined, rather than a question of how much. The agencies administering coal leasing and mining activities will have to carry the burden of insuring that areas with critical problems or unique values are avoided as planning and development take place. There is also a "need" for all groups dealing with or interested in energy developments to face the controversial issues in full public view as soon as the issues become apparent, so that differences can be resolved early, before commitments to development and large expenditures have been made.

Land Conservation Measures

Conservation of land resources in the past has been motivated primarily by economic improvement or development considerations. Traditionally, land conservation measures have been one means of meeting these goals, and present land treatment programs were established and funded on this basis. In the past decade, more emphasis has been placed on the need for measures that will improve water quality in streams and lakes. Relative to this problem, it has been determined that sediment and irrigation water return flows are the greatest pollutants and carriers of other pollutants. Accordingly, reductions in sediment load and return flows would greatly improve water quality for many uses. Since many of the land conservation measures needed to achieve improved water quality will only provide limited on-farm benefits, an accelerated land treatment program should be considered that will include the following elements:

1. Increased efforts of educating landowners to accelerate application of conservation measures;

2. Increased cost-sharing to provide a greater incentive to the landowner; and

3. Additional technical assistance for planning and installing conservation measures.

Land conservation needs outlined in the previous chapter are not peculiar to any particular planning area and so have been treated on a general or areawide basis. The mere fact that there are areas that need treatment to protect their soils provides the opportunity for meeting needs. Land conservation programs are essentially "man and the land" type endeavors, where land use practices and measures are designed to provide optimum protection to the affected area. This protection has both economic and environmental values, so there are land conservation proposals in both the national economic development and environmental quality proposals that follow in chapter 6.

Flood Control

A review of historical flood data indicates that total damages continue to increase even though a large number of flood control programs have been implemented. There are two reasons for this paradox. First, long-term economic trends have increased the value of property, materials, and labor which, in turn, has caused the value of improvements subject to flooding to increase and thus cause flood losses themselves to grow accordingly. Second, continuing economic expansion creates demands for land on which new improvements can be located. In many instances, this has resulted in development on the flood plain of new improvements, which became subject to flood damage.

It is apparent that a need exists for flood plain management. With proper management of water and the lands subject to inundation, the trend of increasing flood damages can be slowed materially, if not reversed. However, to attain such management is not a simple task. Studies which take into account known flood risks can determine the best use of the flood plain lands, but, because flood plain regulation is viewed by many as an infringement of property rights, the implementation of effective flood plain regulation is difficult. Notwithstanding this type of resistance, there is a growing commitment on the part of Federal, State, and local interests to the concept of strict flood plain management. This means that in planning for flood damage reduction both structural and nonstructural measures must be evaluated.

Streambank Erosion

Streambank erosion contributes sediment to the area's streams, degrading water quality and causing the loss of much productive land each year. It is greatest on streams that have been straightened in the past and which are now seeking to widen their channels. Streams with silty or sandy banks are also a particular problem.

Under section 32 of the Streambank Erosion Control and Demonstration Act of 1974, as amended by the Water Resources Development Act of 1976, authority for work has been expanded to include the Yellowstone River from Intake, Mont., to its mouth. The original act authorized work on the Missouri River in the reach below Garrison Dam and in the reach between Fort Randall Dam and Sioux City. The intent of this program is to develop a demonstration of structural means for controlling bank erosion with a view toward developing those most cost effective and environmentally acceptable. Several initial sites have been selected along the Missouri River in Nebraska, South Dakota, and North Dakota. Additional sites will be selected on both the Missouri and Yellowstone Rivers as funding and scheduling permit.

Fish and Wildlife

Fish and wildlife needs take several forms including new or adjusted legal, social, and institutional changes; the enhancement or preservation of the fish and wildlife environments, including streamflow; and mitigation of losses due to other resource development. Some of the opportunities for satisfying these needs include adopting laws to assure habitat mitigation, expanding incentive programs such as soil bank and water bank to enhance fish and wildlife resources, expanding the wetlands acquisition program, and providing State reservation of instream flows.

Outdoor Recreation

There are many alternatives useful in satisfying outdoor recreation needs. These include riverfront access purchase or easements, "hold use" easements which would preserve present recreation values and control development, tax incentives to private landowners to allow public recreation use of their land, flood plain municipal parks, purchase of river access for developments, sandpit lake developments, and others.

In urban areas with developed parkland deficiencies undeveloped flood-prone lands are generally available. Their slopes are gentle, the lands fertile, and usually they are better suited to accommodate day-use recreation demands than are nonflood plain lands. Properly developed and managed, they can be a valuable recreation asset. Because of their naturally occurring woodlands and attractive setting, such areas are suitable for parks, playgrounds, golf courses, picnic areas, and other outdoor recreational facilities. Early acquisition of such areas within the limits of projected needs would preempt adverse encroachment of intensive developments and, at the same time, reduce associated flood damages by substituting appropriate land uses and facilities which receive only minor damage from flood flows.

Many stream reaches possess natural recreational resources but have limited public access. To meet existing and projected requirements for outdoor recreation, scattered tracts or "nodes" of various sizes could be acquired to provide such public access. These nodes could be developed primarily for day use, with trails, campgrounds, picnic areas, and play areas.

Recreation areas, particularly along interstate highways, must be used within their capability to accommodate the needs of both resident and nonresident users. For some reaches where canoeing is proposed as a major activity, primitive camp sites interspersed between day-use areas should be considered. These reaches would require adequate flows to assure canoeing and related activities, reinforcing the need of adequate flows for fish and wildlife preservation.

Water Quality Control and Instream Flows

One of the major water quality problems is the large sediment load carried by most of the area streams, originating in part from man-induced erosion but due to a larger degree by natural processes. The ongoing "208" programs and the land conservation efforts discussed elsewhere in this report will tend to reduce erosion, and the water quality laws and regulations currently in effect will tend to limit further deterioration of water quality in the area. These ongoing programs, even though accelerated, will not wholly solve the water quality problems of the region, but they should keep them within reasonable bounds. The remaining need related to this function, as it is treated in this analysis, is to insure that resource developments proposed for any purpose do not *create* erosion and water quality problems.

To preserve environmental values and the riverine ecosystems, it is necessary to maintain streamflows at various levels depending upon the particular stream and its projected use. To provide a system in which all uses of water are equitably recognized, changes in State laws would be required. Fish and wildlife interests feel it would be desirable to keep intact the "base flow" of all principal streams; that is, the flow in the stream during periods of no storm runoff. However, keeping intact only the "base flow" would not meet all the seasonal needs of fish, wildlife, and recreation. Suitable instream flows established on a monthly basis would still allow some excess water to be available for development in some streams, although full development may require offstream storage of high spring flows to satisfy late season demands.

Potential Developments for Meeting Needs

Opportunities for development, preservation, and conservation of water and related land resources were generally identified early by the State study teams, but in some cases they were impossible to discern until all resource needs were identified and correlated. These opportunities included consideration for resource proposals developed under earlier studies, but only on the basis of updating to reflect current planning concepts, resource constraints not originally known, current local support or disinterest, and current beneficial and adverse effects. Utilizing these concepts, such potential projects and programs were evaluated and the results scrutinized in light of the planning objectives and goals, the problems and needs of the individual planning areas, and the localities affected. Where possible, combinations or adjustments were effected to provide multipurpose use of the resources, and alternative methods of achieving the desired result were evaluated. In this process, certain single-purpose alternatives were eliminated in favor of others as in favor of multipurpose alternatives.

The following tables contain a brief description of the potential developments which survived an initial screening process and were later subjected to evaluation and the plan formulation procedures presented in chapter 6. Many of the elements have multipurpose values, but, due to space limitations, only the major features have been itemized while other associated functions were omitted. The potential developments for meeting needs are grouped according to planning area and are not listed in any special order.

Table 30
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
UPPER YELLOWSTONE PLANNING AREA, MONT.

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Flathead Creek near Wilsall	8,340 AF in 2 reservoirs for 5,000 acres of irrigation	216	232
Sweet Grass Creek, northwest of Melville	27,000 AF in 2 reservoirs for 14,900 acres of irrigation	334	748
East Rosebud Creek, south of Roscoe	15,000 AF reservoir for 3,206 acres of irrigation	138	182
Pryor Creek, northeast of Pryor	Reservoir canals, and laterals for 4,200 acres of irrigation	243	322
Whitehorse Bench Unit, north of Silesia	Pumping plant and sprinkler irrigation for 2,000 acres	181	213
Huntley South Unit, northeast of Huntley	Pumping plants, canals, and laterals for 3,840 acres of irrigation	390	410
West Billings Local Protection	Canyon Creek diversion for flood control	247	334
Accelerated Land Conservation, areawide	447,000 acres of additional land treatment	1,577	Assumed more than costs
Seven Mile-Sitting Bull Unit, near Custer	Pumping plants, canals, and laterals for 6,508 acres including 1,700 acres presently irrigated	719	590
Removel of spawning barriers on Cedar, Eightmile, and Rock Creeks	Highway and railroad culverts	Culvert Modification	Allow passage of salmonoids
Antelope Creek storage near Shields River	19,000 AF reservoir for streamflow augmentation	622	Improve instream flows
Wheat Basin and Broadview Wildlife Refuges near Molt	Waterfowl breeding and resting grounds created by pumping plant	Not available	Support for existing and new refuges

Table 30, Continued
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
UPPER YELLOWSTONE PLANNING AREA, MONT.

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Beartooth Wilderness Area	New legislation	Not available	Preserve and protect a unique natural area
Sweet Grass Creek Storage near Big Timber	27,000 AF in 2 reservoirs	334	Streamflow augmentation
Streambank Greenbelt Program	Restoring denuded grassed and forested areas	Unknown	Protection from streambank erosion and improved habitat
Instream flows, areawide	Implementation of existing legislation	Unknown	Preserve existing habitat and water quality
Rehabilitation of Headwater Basin, Shields River	Improved Management	Not available	Prevent deforestation
Yellowstone River, Gardiner to Pompeys Pillar	National Wild and Scenic River designation for 225 miles	3,324	2,832
Boulder River, Upside-Down Creek to Yellowstone River	State Recreational Waterway designation for 58 miles	386	283
Shields River, Flathead Creek to Yellowstone River	State Recreational Waterway designation for 40 miles	507	196
Stillwater River, 20 miles upstream of Woodbine Campground to Yellowstone River	State Recreational Waterway designation for 65 miles	454	318
Flow Regimen Improvement of Tributary Streams	Institute better water conservation and land use measures	Not available	Improve trout habitat
Management of Yellowstone River Islands	Proper management of island habitat	Not available	Increase goose and other wildlife population

Table 31
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
CLARKS FORK-BIGHORN PLANNING AREA, MONT.

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Elbow Creek Unit near Joliet	11,000 AF reservoir for 6,800 acres of irrigation	200	367
Blue Water-Five Mile Creek Unit south of Laurel	12,000 AF reservoir for 5,350 acres of irrigation	193	316
Wyola-Lodge Grass Unit north of Wyola	Diversion dam and canals for 2,900 acres of irrigation	35	254
Long Otter and Gas Field Pump Units near Crow Agency	Pumping plants and canals for 2,270 acres of irrigation	39	199
Hardin Unit, near Yellowtail Dam	Pumping plants and canals for 43,750 acres of irrigation	4,479	6,221
Accelerated Land Conservation, areawide	410,500 acres of additional land treatment	777	Assumed more than costs
Yellowtail Afterbay Power plant downstream of Yellowtail Dam	11.4 MW bulb-type turbines	751	1,128
Instream flows, areawide	Implement existing legislation	Unknown	Preserve existing habitat and water quality
Beartooth Wilderness Area	New legislation	Not available	Preserve and protect a unique natural area
Streambank Greenbelt Program	Restoring denuded grassed and forested areas	Unknown	Preservation from streambank erosion and improved habitat
Bighorn River, Bighorn NRA to Yellowstone River	State Recreational Waterway designation for 80 miles	699	525
Clarks Fork River, Wyoming border to Yellowstone River	State Recreational Waterway designation for 75 miles	943	307

Table 32
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
TONGUE-POWDER PLANNING AREA, MONT.

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Tongue River Reservoir Modification near Wyoming border	58,000 AF added storage for 13,000 acres of irrigation plus industrial water	3,622	3,622
Moorhead and Lower Powder Units near Wyoming border	275,000 AF reservoir for 11,300 acres of irrigation plus industrial water	6,346	8,410
Miles City Local Protection	3-mile levee for urban flood protection	363	442
Accelerated Land Conservation, areawide	721,300 acres of additional land treatment	790	Assumed more than costs
Instream flows, areawide	Implement existing legislation	Unknown	Preserve existing habitat and water quality
Streambank Greenbelt Program	Restoring denuded grassed and forested areas	Unknown	Protection from streambank erosion and improved habitat
Tongue River, Tongue River Reservoir to mouth	State Recreational Waterway designation for 115 miles	1,419	586

Table 33
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
LOWER YELLOWSTONE PLANNING AREA, MONT.

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Conns Coulee Unit, 3 miles southwest of Terry	Pumping plants and canals for 2,700 acres of irrigation	225	288
Haley Unit, between Miles City and Glendive	Pumping plants and canals for 2,372 acres of irrigation	218	253
Marsh Unit, 22 miles from Glendive	Pumping plants and canals for 2,759 acres of irrigation	253	294
Seven Sisters Unit, 5 miles from Sidney	Pumping plants and canals for 3,205 acres of irrigation	307	342
Fox Creek South Unit, 2 Miles from Crane	Pumping plants and canals for 1,570 acres of irrigation	106	157
Accelerated Land Conservation, areawide	1.8 million acres of additional land treatment	2,972	Assumed more than costs
Yellowstone River, Pompeys Pillar to North Dakota	National Scenic or Recreation River designation for 260 miles	3,636	4,056
Streambank Greenbelt Program	Restoring denuded grassed and forested areas	Unknown	Protection from streambank erosion and improved habitat
Instream flows, areawide	Implementation of existing legislation	Unknown	Preserve existing habitat and water quality
Hay Creek Unit, 15 miles west of Forsyth	Pumping plants and canals for 4,350 acres of irrigation	569	451
Forsyth Unit, 5 miles southeast of Forsyth	Pumping plants and canals for 8,810 acres of irrigation	954	864
Fallon Bench Unit, south of Fallon	Pumping plants and canals for 10,750 acres of irrigation	1,254	1,054
Broadview Bench Unit, 6 miles southwest of Terry	Pumping plants and canals for 6,240 acres of irrigation	658	611
War Dance Unit, 3 miles northeast of Intake	Pumping plant and canal for 1,425 acres of irrigation	176	136
Yellowstone River, Intake, Mont., to mouth	Streambank protection at 24 key locations	430	Prevent loss of valley land

Table 34
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
NORTH DAKOTA TRIBUTARIES PLANNING AREA

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Hazen Flood Control	Watershed project to protect Hazen from Antelope Creek	17	40
Missouri River, Garrison Dam to Heart River	Scenic or Recreation River designation for 86 miles	1,252	1,419
Cannonball Unit, near Elgin	241,000 AF reservoir for multipurpose use	1,632	4,367
Thunderhawk Unit, near Hettinger	258,000 AF reservoir for multipurpose use	1,555	2,441
Bronco Dam and Reservoir	95,000 AF reservoir for multipurpose use	2,599	3,511
Garrison Dam, added hydropower	272 MW of installed capacity	6,070	9,604
Knife River Historical Site, near Stanton	1,800 feet of streambank protection	7	Protect historical Indian village
Yellowstone River, State line to mouth	Scenic or Recreation River designation for 22 miles	263	110
Knife River, Manning to mouth	Scenic or Recreation River designation for 76 miles	964	380
Heart River, Heart Butte Dam to mouth	Scenic or Recreation River designation for 106 miles	1,613	530
Cannonball River, Shields to Bridge 1806	Scenic or Recreation River designation for 45 miles	577	225
Unique woodland areas, along Little Missouri River	Preservation of 11,000 acres through legislation and easements	20	Protection of State's only natural Ponderosa Pine

Table 34, Continued
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
NORTH DAKOTA TRIBUTARIES PLANNING AREA

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Instream flows, areawide	New legislation	Unknown	Preserve existing habitat and water quality
Hazen-Stanton Unit, near mouth of Knife River	Pumping plants and canals for 12,650 acres of irrigation	1,845	1,192
Oliver-Sanger Unit, near Washburn	Pumping plants and canals for 8,000 acres of irrigation	1,181	750
Upper Painted Woods Unit, southeast of Washburn	Pumping plant and canal for 610 acres of irrigation	97	59
Little Heart Unit, near Mandan	Pumping plants and canals for 3,100 acres of irrigation	344	301
Fort Yates Unit, near Lake Oahe	Pumping plants and canals for 4,260 acres of irrigation	500	412
Mott Unit, near Mott	218,000 AF reservoir for multipurpose use	2,017	638
Mott Local Protection	Levees along Cannonball River for urban flood control	153	112
Missouri River, Garrison Dam to Lake Oahe	Streambank protection at 21 key locations	800	Prevent loss of valley land

Table 35
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
WIND-BIGHORN-CLARKS FORK PLANNING AREA, WYO.

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Upper Badwater Creek, Fremont and Natrona Counties	1,170 AF reservoir for flood control and irrigation	51	57
Upper Beaver Creek, southern Fremont County	14,500 AF reservoir for flood control and irrigation	120	176
Crow Creek, northern Fremont County	10,000 AF reservoir for flood control and irrigation	80	152
Muddy Ridge Area, north of Riverton	Diversion and canals for 18,000 acres of irrigation	895	910
Popo Agie River, Shoshone National Forest	State Scenic or Recreation River designation for 29 miles	45	78
Sand Mesa, west of Boysen Reservoir	Wildlife habitat and irrigation	100	150
Taylor-Dutch Flat Ditch, southeast of Lander	Concrete-lined canal	15	40
Bighorn Unit, north of Worland	Pumping plants and canals for 1,730 acres of irrigation	194	249
Buffalo Bill Enlargement, west of Cody	25-foot raise to provide 271,300 AF for multi-purpose use	2,964	2,594
Cody Canal Rehabilitation, south of Cody	Delivery canal for 2,000 acres of irrigation	298	383
Hidden Valley, Fremont County	300 AF reservoir for supplemental irrigation	22	114
Cody Pump Area, north of Cody	Pumping plants and canals for 510 acres of irrigation	37	73
Crooked Creek, Big Horn County	Ten deep wells for 1,400 acres of irrigation	25	32
Gooseberry Creek, near Neiber	Reservoir and canal for 2,110 acres of irrigation	75	106
Greybull Flat Unit, northwest of Greybull	Pumps and canals for 980 acres of irrigation	63	141
Lower Greybull River, near Otto	Drainage for 21,200 acres of irrigated land	380	933

Table 35, Continued
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
WIND-BIGHORN-CLARKS FORK PLANNING AREA, WYO.

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Lakeview Canal Rehabilitation, southwest of Buffalo Bill	Canal lining and structure replacement for irrigation project	109	115
Lateral H-103 Improvement, northeast of Buffalo Bill	Closed pipe system for existing irrigation project	61	62
Lateral R-9N Improvement, west of Powell	Canal lining and buried pipeline for existing irrigation project	10	13
N. Fork Shoshone River, Pahaska Teepee to Buffalo Bill	U.S. Forest Service Recreation River designation for 26 miles	77	190
Nowood River, southwest of Big Trails	18,000 AF reservoir for irrigation and flood control	98	192
Porcupine Creek-Devil Canyon, source to State line	State Scenic or Recreation River designation for 22 miles	36	34
Sage Creek - Pryor Mountain, near Frannie	1,300 AF reservoir for regulation of irrigation canal	91	246
Shell Creek—Source to Bighorn National Forest Boundary	National Scenic or Recreation River designation for 26 miles	38	66
Lower Shell Creek, east of Cody	Off-stream reservoirs for 1,940 acres of irrigation	50	81
Sidon Canal Rehabilitation, near Byron	Canal lining and structures for irrigation project	232	326
Westside Irrigation, near Manderson	Pumping plants and canals for 25,000 acres of sprinkler irrigation	2,002	2,300
Badger Basin Unit, southeast of Clark	Pumping plant and laterals for 1,600 acres of irrigation	134	162
Clarks Fork, State line to Crandall Creek Bridge	National Recreation River designation for 20 miles	73	109
Cyclone Bar, near Clark	Diversion dam and canals for 5,366 acres of irrigation	107	176
Offstream Storage, Badger Basin and Cyclone Bar	24,470 AF reservoir for irrigation, recreation, and instream flow	366	205

Table 35, Continued
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
WIND-BIGHORN-CLARKS FORK PLANNING AREA, WYO.

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Accelerated Land Conservation, areawide	2 million acres of added land treatment	2,956	Assumed more than costs
Green Valley Ranches, north of Shoshone	Pumping plant for sprinkler irrigation of 5,100 acres	530	360
Kirby Draw, near Riverton	Pumping plants for sprinkler irrigation of 11,200 acres	1,025	675
North Hudson, near Hudson	Pumping plant for sprinkler irrigation of 6,200 acres	674	397
Preacher Draw - Beaver Creek, between Hudson and Riverton	Pumping plants for sprinkler irrigation of 7,400 acres	766	473
Winchester Unit, near Fort Washakie	Diversion canal and reservoirs for 9,680 acres of irrigation	1,088	611
Banjo Flats, southeast of Worland	Canal and pumping plant for sprinkler irrigation of 10,400 acres	1,099	757
Polecat Bench, north of Powell	6,000 AF reservoir and canals for 20,470 acres of irrigation	3,401	3,058
Shoshone Extensions (South) YU Bench	Reservoir and canals for 17,270 acres of irrigation	2,930	2,085
McCollough Section, Shoshone Extension (south)	Pumps and laterals for 1,110 acres of irrigation	61	160
Sage Section, Shoshone Extension (south)	Pumps and laterals for 2,140 acres of irrigation	82	211
Flood Plain Management, areawide	Activate regulations for sound land use	Not Available	Reduced flood damages; preservation of wildlife habitat
Instream flows, areawide	New legislation	Unknown	Preserve existing habitat and water quality
Wind River, Source to Boysen Reservoir	National Wild, Scenic, or Recreation River designation for 120 miles	1,387	666

Table 35, Continued
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
WIND-BIGHORN-CLARKS FORK PLANNING AREA, WYO.

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		Thousand Dollars	
Bighorn River, Wind River Canyon	National Recreation River designation for 12 miles	135	94
Bighorn River, Wind River Canyon to Bighorn Lake	State Recreation River designation for 98 miles	1,236	375
Environmental Protection Dikes, Buffalo Bill Enlargement	Dike system for dust abatement	782	Air quality control and waterfowl enhancement
Cloud Peak Primitive Area, Bighorn National Forest	New legislation for designation as wilderness area	6	57
N. Fork Shoshone River, National Forest to Buffalo Bill	State Recreation River designation for 10 miles	136	61
Tensleep Creek, lake to Tensleep	State Scenic and Recreation River designation for 23 miles	113	80
Clarks Fork, Canyon mouth to State line	State Recreation River designation	183	76
Clarks Fork, Crandall Creek Bridge to mouth of Canyon	National Wild and Scenic River designation for 22 miles	66	93
High Country Lakes, Beartooth Area	New legislation for designation as wilderness area	Not Available	Preserve and protect a unique natural area
Off-stream Storage, Clarks Fork Basin	6,500 AF reservoir for recreation and low flows	91	Create wild-life habitat and improve water quality
Sunlight-Crandall Basins, Upper Clarks Fork	Establish development control programs	450	Scenic ease-ments to retain land on tax roles
Mule Butte, Wind River Indian Reservation	Pumping plants for sprinkler irrigation of 17,280 acres	2,028	1,042

Table 36
POTENTIAL DEVELOPMENTS FOR MEETING NEEDS
NORTHEAST WYOMING PLANNING AREA

Project Name and Location	Major Features	Average Annual Costs	Average Annual Benefits
		---- Thousand Dollars	----
Crazy Woman Unit, near Buffalo	Reservoir and pumping plants for irrigation of 9,528 acres	1,010	1,555
Accelerated Land Conservation, areawide	11.5 million acres of added land treatment	4,600	Assumed more than cost
Middle Fork Crazy Woman, near Buffalo	4,400 AF reservoir for irrigation of 3,000 acres	169	286
Northeast Wyoming Water Supply, near Gillette	Pumping plants, deep wells, and reservoirs for irrigation, industry, recreation, and fish and wildlife	16,514	19,762
Piney Unit, near Buffalo	Reservoir and canals for new and supplemental irrigation	807	1,804
Sheridan Local Protection	Stage III of levees and channels for flood control	61	61
South Tongue River-Prairie Dog Project	Reservoir, conduit, and canals for irrigation and industry	1,238	4,224
South Tongue Watershed, near Sheridan	Reservoir and canals for irrigation of 9,200 acres	343	357
Ucross Unit, near Buffalo	Purchase or exchange of Lake DeSmet water for irrigation of 3,750 acres	499	513
Kaycee Project, Powder River	Reservoir and canals for new and supplemental irrigation of 8,700 acres	2,227	1,127
Cabin Creek Watershed, near Keyhole Dam	Reservoir for flood control and irrigation of 330 acres	26	26
South Tongue River, source to South Fork Reservoir	Scenic or Recreation River designation for 27 miles	42	133
Tongue River, source to Forest boundary	National Scenic or Recreation River designation for 26 miles	60	68
Tongue River, Forest boundary to State line	State Recreation River designation for 35 miles	197	189

CHAPTER 6

PLAN FORMULATION

Planning Procedures

Principles and Standards

Criteria used for evaluation of projects and formulation of the alternative plans set forth later in this chapter are those established under the multiobjective planning (MOP) approach of the U.S. Water Resources Council. MOP guidelines for the study conform with the Water Resources Council's *Principles and Standards for Planning Water and Related Land Resources.*

Alternative plans have been formulated to emphasize national economic development (NED) and environmental quality (EQ). A third, but partial, plan emphasizing local-State-regional development (SRD) has been included to identify projects which, with the addition of regional benefits, qualify for such development, but do not meet NED criteria. A fourth plan, called the recommended plan (RP), is a combination of those projects or programs selected from the NED, EQ, and SRD plans, that best meet the needs outlined in chapter 4.

Plan formulation for the NED and SRD plans is tied primarily to the monetary benefit, cost, and repayment evaluation of potential projects or programs (components). To be included in the NED or SRD plan, components must show user benefits exceeding costs and an apparent source of repayment of project costs. EQ plan formulation criteria emphasize environmental enhancement, preservation, or management as the principal objectives. Each of the four plans is described in more detail later in this chapter.

The beneficial and adverse effects of a proposed development are evaluated for the period of the useful life of the major project facilities, with an upper limit of 100 years. A discount rate of 6 - 3/8 percent[1] was used for the Yellowstone Study. Benefits and costs occurring in different time frames over the period of analysis were adjusted to comparable values by the use of the 6 - 3/8 percent discount rate. Costs and benefits are based on January 1975 prices unless other dates are specifically identified.

The absence of State or Federal governmental planning, financing, construction, and controls beyond current levels as envisioned for the "without" plan would result, in some cases, in levels of development exceeding any of the "with" plans. This suggests that overutilization or misallocation of resources as well as underutilization, would sometimes occur in the absence of adequate planning.

It suggests also that the recommended plan formulated on current MOP guidelines is subject to changes. It is conceivable that unforeseen national or regional needs may be identified which could move presently unrecognized components or recognized but unjustifed components to the top of the priority list.

[1] A rate of 6 - 1/8 percent was in effect when this study began, and a few projects have been evaluated at that rate. All such projects have been checked to insure that the changed (6 - 3/8 percent) rate would not affect their economic feasibility.

The 4-Account System

Under multiobjective planning procedures, each plan, regardless of which objective is emphasized, is evaluated and displayed in terms of a 4-account system—national, regional, environmental, and social factors. This means that each project or program proposed for consideration in any of the plans must be evaluated on a comprehensive basis.

Benefits and costs for the national and regional accounts are expressed as monetary values, but also include a descriptive analysis of beneficial and adverse effects. For the other two accounts—environmental and social factors—the emphasis is on identifying and evaluating changes that could occur (or that by design would not occur) with a plan, and on describing associated beneficial or adverse effects.

National Economic Development Account—Benefits evaluated under the national account are direct user benefits, displayed for project purposes such as irrigation, flood control, recreation, fish and wildlife, M&I water, and electric power. User benefits are measured as net income increases, damage reductions, or proxy values of alternative actions to direct project beneficiaries. Income increases may include the net increases in salaries of persons who actually work on the project during construction or operation and who would be unemployed or underemployed in the absence of the project. Benefits may not include second-level effects such as income to business resulting from the project. National account costs are measured as the economic values placed on the resources required to implement a plan and place it in operation.

Environmental Quality Account—A water and land resources plan may have a variety of effects, beneficial and adverse, on the natural environment. While monetary effects do occur and should be shown, effects on the environment are generally characterized by their nonmarket, nonmonetary nature.

Beneficial environmental effects are contributions resulting from the management, preservation, or restoration of one or more of the desirable natural environmental characteristics of an area under study. Adverse environmental effects are consequences of proposed actions that result in environmental deterioration.

Regional Development Account—Benefits and costs evaluated under the regional account are those, including NED values, that would occur within the boundaries of the study area. These local effects are determined for three areas: the local area, adjacent area, and the rest of the Nation. For purposes of this study, the adjacent area is defined as the rest of the State. Direct NED effects occur in the local area and in some of the other areas as well as the Nation. Secondary effects on the local economy are usually offset by changes in other regions. Increased employment in the local region due to a project is offset by reduced employment in other regions under the assumption of full employment.

Local monetary benefits are estimated for four income categories: (1) user benefits (the NED values), (2) benefits induced by and stemming from effects, (3) construction impacts, and (4) unemployment and underemployment effects.

"Induced by" benefits result from increased net returns to those who supply goods and services to the direct project beneficiaries. "Stemming from" benefits are those that accrue to the people who *handle or use the output of the direct project* beneficiaries. Construction impacts are estimated as the income increases accruing to the region from wage payments to imported labor forces during the construction period. Income increases to the unemployed and underemployed persons in the region are estimated as portions of the induced and stemming effects and construction impacts and are assumed to be significant only during the early years of project or program life.

Local costs include local payments toward construction and operation and regional tax contribu-

tions. Both adverse and beneficial effects that are not evaluated monetarily are measured in appropriate terms and displayed in the local account.

Social Well-Being Account—Beneficial and adverse social effects are derived from a plan's success or failure in meeting social needs. The identification and satisfaction of social needs will relate to the social deficiencies expected to prevail in the study area without a plan as compared to the expected changes, social gains, or losses, with a plan.

The multiobjective planning guidelines for evaluating social factors were written to emphasize the effects on those users of projects or programs who have failed to share in rising economic standards. This would seem to focus on the unemployed or underemployed person effects, which, according to regional benefit evaluation criteria, would be significant only during the early years of project life.

Opportunities for improving social status are available through implementation of resource development; however, documentation of the actual benefiting social group is not possible. Social effects are, therefore, evaluated and displayed only for projects and programs that are included in the alternative plans and are not considered as an end in themselves.

Project Formulation

When a project or program has been evaluated and the results tabulated under the 4-account system, it is then possible and necessary to test the proposal in terms of its acceptability for inclusion in the various "objective" plans. Each of these plans has specific requirements that must be met if a project or program is to be included. A particular proposal may qualify for more than one plan, and to the extent that this is so, the proposal's attractiveness for inclusion in the recommended plan is enhanced. No project or program may be included in the recommended plan unless it has qualified for at least one of the three objective plans, but modifications may be made to accommodate additional functional needs. The limiting criteria for the objective plans, briefly stated, are:

Plan Emphasizing NED Objective—National economic development is achieved by increasing the value of the Nation's goods and services, by utilizing additional resources, or by improving the efficiency of existing resource use. Theoretically, the best NED plan will produce the maximum net benefits as an excess of projected monetary benefits over monetary costs. A satisfactorily developed plan with NED emphasis will meet the following minimum requirements:

1. User benefits are in excess of total economic costs;

2. Separable costs of each functional component are less than benefits or the alternative cost of producing comparable benefits;

3. Sufficient capability is in prospect to repay all reimbursable costs;

4. Significant local and State support is apparent; and

5. Output from the plan will be used to meet near-to-intermediate-term needs.

Plan Emphasizing EQ Objective–The objective of the environmental quality plan is the management, conservation, preservation, creation, restoration, or improvement of natural and cultural resources and ecological systems. Although the EQ plan is not subjected to a benefit-cost comparison as such, the plan should reflect the most efficient way of obtaining the desired results. To the extent that monetary benefits or costs accrue, they should be shown under the NED or SRD accounts in the 4-account system.

Primary consideration is given to environmental protection or enhancement utilizing those unique or natural resources of the study area where they exist. A measure of their importance should recognize the available supply at the local, regional,

and national level. Consideration for the preservation of those resources that are scarce or irreplaceable should be given a high priority.

Plan Emphasizing SRD Objective—Local development is accomplished by utilizing available local, regional, and national resources to alleviate chronic or cyclic economic conditions of low income, high unemployment, or other persistent economic or social problems within the region, but only in those cases where there is a known or reasonably predictable non-Federal source of financing for all of the project or program costs. An acceptable plan with SRD emphasis must meet these criteria:

1. Monetary benefits (user benefits plus other regional benefits) must exceed total costs;

2. Sufficient repayment capability is apparent to meet cost-sharing requirements; and

3. Demonstration that non-Federal financing can be expected.

Procedures

Some projects and programs listed in chapter 5 are not included in the following three plans. Dropped due to an insufficient water supply were the Crazy Woman and Piney Units in Northeast Wyoming. The South Tongue River Watershed in Northeast Wyoming was incorporated into the South Tongue-Prairie Dog multipurpose project for the NED and SRD plans but was the alternate finally included in the recommended plan.

Projects that are listed in more than one plan are varied slightly to enhance various purposes, or because they are felt to be suitable under more than one plan.

The National Economic Development Plan

The objective of the national economic development (NED) plan is to enhance national economic development by increasing the value of the Nation's output of goods and services and improve national economic efficiency. The word needed is very important, because there must be, somewhere in the national economy, a demonstrable demand for the goods, materials, or services that will be produced, if those effects are to be included in the benefit evaluations. Since the NED plan is oriented to the national economy, it is geared to national choices among alternatives rather than to regional or local choices.

The same philosophy applies to costs—it is the total cost *to the Nation* that is to be considered. Some of those costs, particularly those related to the environment, social values, and other effects that are hard to evaluate in dollar terms, are often considered as negative benefits. The result is the same—they affect the all-important relation between costs and benefits. The point here, however, is that what is measured are all costs no matter to whom they accrue and all benefits no matter to whom they accrue in determining whether or not an element belongs in the NED plan. Benefits and costs (secondary) of that element to the local and adjacent areas that are measurable in dollars are to be displayed, however, in the recommended plan account previously discussed. Environmental benefits and costs of the NED plan element are to be displayed in the environmental quality account. Direct national costs will accrue to one, two, or all of the regions. Some secondary costs may accrue to one area and be offset by benefits in another area. Offsetting, i.e., secondary, benefits and costs are not to be considered in determining whether or not a plan element meets NED criteria.

The NED plan is geared to maximizing the net value of goods and services to the Nation. Often the NED plan elements will be financed by the Federal Government. This does not mean that there should be no repayment of costs by the beneficiaries; it simply means that raising the capital required to get the development underway will be a Federal responsibility. In some instances, however, it could be to a State or local entity's interest to finance all or some part of an NED project. There is no restriction against such action.

The projects and programs that meet some national need and produce direct benefits in excess of total costs are summarized in the following tables. The beneficial and adverse effects of the NED plan elements have been evaluated and are displayed for each of the seven planning areas in tables 37 through 43.

Table 44 shows the NED energy resource requirements and air pollution emissions.

TABLE 37
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, UPPER YELLOWSTONE

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
MULTIPURPOSE **Flathead Creek Project** SCS Gavins Point Study Gallatin/Park Counties	First Cost $3,088,700 Annual Benefits $231,900 Annual Cost $216,400	*BIGHORN BASIN* Increased late season instream flows, 500 acres of increased waterfowl habitat, and lake fishery. Loss of 2 miles of a small mountain stream and 500 acres of riparian dryland habitat	User Benefits $231,900 Regional Benefits $101,200 Total Benefits $333,100[1]	Stabilize population, income, and increase seasonal jobs. Minor population impacts during construction are minimized with trailer housing.
Sweet Grass Creek Project SCS Gavins Point Study Park/Sweet Grass Counties	First Cost $4,104,000 Annual Benefits $748,000 Annual Cost $334,500	Improved upland wildlife habitat, increased late summer flows, and 800 acres of improved waterfowl habitat. Loss of 2 miles of live stream and 170 acres of prairie habitat, and increased dissolved solids in return flows	User Benefits $748,000 Regional Benefits $238,400 Net Benefits $651,900	Minor population stabilization, increase seasonal jobs, economic stability, and construction employment Minor population impact on town of Big Timber during two construction seasons could be handled by motels and trailer parks
East Rosebud Creek Project SCS Gavins Point Study Carbon/Stillwater Counties	First Cost $1,986,200 Annual Benefits $182,100 Annual Cost $137,800	Increased flat water and mountain scenery, waterfowl habitat, and streamflow ice fishing. Loss of 2 miles of stream habitat, 800 acres mountain valley, and 2 miles of stream fishery.	User Benefits $182,100 Regional Benefits $37,800 Net Benefits $82,100	Minor population stabilization increase seasonal jobs, economic stability, and construction employment Motels and trailer courts in Red Lodge and Columbus can handle construction workers and their families

[1] Total benefits to the region, not necessarily comparable to NED costs because there may be regional costs (increased municipal service requirements for example) not included in the project cost figures.

TABLE 37, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, UPPER YELLOWSTONE

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Pryor Creek Project SCS Wind/Bighorn Survey Big Horn/Yellowstone Counties	First Cost $3,496,900 Annual Benefits $322,100 Annual Cost $243,600	Create a 750 acre lake, trap sediment, improve wildlife habitat, reduce bank erosion, increase waterflows, improve pheasant habitat, and reduce wind erosion. Increase mud flat during drawdown, inundate 2 miles of class IV stream (700 acres of bottomlands), and a slight increase in dissolved solids.	User Benefits $322,100 Regional Benefits $155,900 Net Benefits $126,500	Stabilize population, preserve family farms, improve Indian income and employment, reduce flooding, and provide flat water recreation. Relocate one farmstead; influx of 16 to 20 construction workers (some with families) would cause few problems.
AGRICULTURE (Irrigation) **Whitehorse Bench Unit** USBR Pick-Sloan Missouri Basin Program Carbon County	First Cost $2,162,000 Annual Benefits $213,400 Annual Cost $181,100	Improved pheasant, waterfowl, and furbearer habitat and reduced wind erosion. Visual intrusion of pumping plant, transmission lines, and other features and minor reduction in quantity/quality of river water and exhaust emissions from farm equipment.	User Benefits $213,400 Regional Benefits $418,900 Net Benefits $451,200	Reduce outmigration and increase and stabilize farmers' and merchants' incomes. Billings could absorb construction crews and their families without affecting its growth rate
Huntley South Unit USBR Single-purpose Irrigation Study Yellowstone County	First Cost $5,142,000 Annual Benefits $409,700 Annual Cost $390,000	Improved pheasant, waterfowl, and furbearer habitat and reduced wind erosion. Visual intrusion of facilities, reduction in grouse habitat, minor reduction in quantity/quality of river water and exhaust emissions from farm equipment	User Benefits $409,700 Regional Benefits $839,900 Net Benefits $859,600	Reduce outmigration and increase and stabilize farmers' and merchants' incomes. Influx of 95 construction workers and their families, with 32 school-age children, would strain community facilities for two years.

FLOOD CONTROL **West Billings Diversion** COE Level B Study Yellowstone County	First Cost $3,620,000 Annual Benefits $334,000 Annual Cost $247,000	Improve human environment through weed reduction.	User Benefits $334,000 Regional Benefits $896,000 Net Benefits $983,000	Protect 2,080 acres of urban land and improvements from flooding, enhance the health and social well-being of 60,000 residents, and encourage more orderly development in the protected areas.
LAND CONSERVATION **Accelerated Land Conservation** A. State and Private Lands 431,000 Acres B. National Resource Lands 13,500 Acres C. Forest Service Lands 2,400 Acres	A. Cap. Cost $18,304,000 *Ann. Equiv. Cost $1,483,400 B. Cap. Cost $167,000 *Ann. Equiv. Cost $13,500 C. Cap. Cost $991,000 *Ann. Equiv. Cost $80,300 Annual benefits—not computed—assumed to be at least equal to costs. *6⅜ percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover resulting from improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flow to streams.	Maintain and enhance the output of goods and services to users in the region. Provide additional employment in the application and maintenance of proposed measures. Provide additional permanent employment in processing increased goods and services.	Improved downstream water quality for all uses. Improve general esthetics of the land Insure that resources are available for use in the future.

TABLE 38
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, CLARKS FORK-BIGHORN

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
MULTIPURPOSE **Elbow Creek Project** SCS Wind/Bighorn Survey Carbon County	First Cost $2,656,800 Annual Benefits $367,500 Annual Cost $200,200	A 340-acre lake, increased waterfowl habitat, and reduced water and wind erosion. Mud flats exposed with drawdown, a 340-acre reduction of sagebrush habitat, precluded development of marginal coal deposit, and slight increase of TDS in streams.	User Benefits $367,500 Regional Benefits $162,900 Net Benefits $331,000	Increased and stabilized income will preserve family farms, increase merchants' incomes, and increase seasonal jobs. Up to 16 construction workers, for two seasons, will benefit rather than have an adverse impact on Joliet, Fromberg, and Bridger.
Blue Water-Five Mile Creek Project SCS Wind/Bighorn Survey Carbon County	First Cost $2,750,900 Annual Benefits $315,900 Annual Cost $192,900	A 310-acre lake, greening effect of irrigation, and resting area for waterfowl. Mud flats exposed with drawdown and a 310-acre reduction of sagebrush habitat.	User Benefits $315,900 Regional Benefits $128,400 Net Benefits $251,400	Increased and stabilized income will preserve family farms, increase merchants' incomes, and increase seasonal jobs. Up to 16 construction workers, for two seasons, will benefit rather than have an adverse impact on Fromberg and Bridger.
AGRICULTURE (Irrigation) **Wyola-Lodge Grass Canal** SCS Wind/Bighorn Survey (Upper Little Bighorn River) Big Horn County	First Cost $551,800 Annual Benefits $253,900 Annual Cost $34,700	Greening effect, create ditch-bank wildlife habitat, and reduce soil and wind erosion. Reduced river flows detrimental to fish and turtles and higher TDS in river.	User Benefits $253,900 Regional Benefits $102,600 Net Benefits $316,800	Stabilize population, preserve family farms, increase merchants' incomes, and increase seasonal jobs. Six to eight construction workers, for one season, will benefit rather than have an adverse impact on the community.
Long Otter and Gas Field Pumping Units SCS Wind/Bighorn Survey (Lower Little Bighorn Eastside) Big Horn County	First Cost $454,500 Annual Benefits $198,800 Annual Cost $38,700	Greening effect, create ditch-bank wildlite habitat, and reduce runoff sediment yield and wind erosion. A slight reduction in flows and an increase in TDS is detrimental to warm-water fishes and amphibians.	User Benefits $198,800 Regional Benefits $102,600 Net Benefits $316,800	Improve income and stability of feed base for 12 ranches, increase seasonal jobs, and increase merchants' incomes. Six to eight construction workers, for one season, will benefit rather than have an adverse impact on the area

Hardin Unit USBR Pick-Sloan Missouri Basin Program Big Horn County	First Cost $66,731,000 Annual Benefits $6,221,400 Annual Cost $4,478,800	Upland game bird and waterfowl populations will increase by 100 percent, hydropowered pumping plant will not consume resources, and muskrats and mink populations will increase by 200 percent, Medicine Wheel, Bozeman Trail, and Fort Smith sites have public access and reduce wind erosion. Deer and antelope populations will decrease by 50 percent, features will be visual intrusions, Bighorn Lake will be depleted by 3 percent, TDS will increase 3 to 6 percent, and sulphate will increase 4 to 7 percent in the Bighorn River.	User Benefits $6,221,400 Regional Benefits $12,347,400 Net Benefits $14,090,000	Increase and stabilize farmers' and merchants' incomes, provide 131 additional farm units, and provide jobs for 407 people directly involved in farm operations Influx of 488 construction workers and their families, including 166 school children.
ENERGY **Yellowtail Afterbay Powerplant (Hydropower)** USBR Big Horn County	First Cost $10,490,000 Annual Benefits $1,127,800 Annual Cost $751,100	Opportunity to generate power in an existing dam will not alter river flows. Visual impact of a 1 mile power line will require effort to preclude serious short-term river pollution during construction.	User Benefits $1,127,800 Regional Benefits $503,000 Net Benefits $879,700	Provide employment for small operation and maintenance force and increase Montana's power capacity without dislocations.
LAND CONSERVATION **Accelerated Land Conservation** A. State and Private Lands 385,000 Acres B. National Resource Lands 25,500 Acres C. Forest Service Lands 0 Acres	A Cap. Cost $9,296,000 *Ann. Equiv. Cost $753,300 B Cap. Cost $303,000 *Ann. Equiv. Cost $24,600 C. Cap. Cost $0 *Ann. Equiv. Cost $0 Annual Benefits—not computed—assumed to be at least equal to costs. *6⅜/8 percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover resulting from improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table Reduction of undesirable return flows to streams.	Maintain and enhance the output of goods and services to users in the region. Provide additional employment in the application and maintenance of proposed measures. Provide additional permanent employment in processing increased goods and services	Improved downstream water quality for all uses Improve general esthetics of the land

TABLE 39
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, TONGUE-POWDER

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
MULTIPURPOSE **Tongue River Reservoir Modification** Tongue River Project Modification Feasibility Study Montana Department of Natural Resources and Conservation Big Horn County	First Cost $49,235,000 Annual Benefits $3,622,000 Annual Cost $3,622,000	No detailed study has been made to determine environmental impacts; if the dam was breeched, the excellent warm-water fishery that presently exists will then be lost.	Regional benefits have not been computed for this project at this time. However, the addition of employment and induced and stemming from benefits will produce positive net benefits under this account.	The restored and expanded reservoir will enable existing irrigation to continue and allow some new irrigation; the industrial water will support expanded energy and industrial development creating employment opportunities and diversification of the area's economy
Moorhead and Lower Powder Pumping Units USBR Yellowstone Level B Study Powder River County	First Cost $88,083,000 Annual Benefits $8,410,000 Annual Cost $6,346,000	Expansion of recreational facilities and opportunities for pheasant and waterfowl hunting may improve. The project will remove sediment, thereby improving water quality; the same level of instream flows will be maintained. The TDS in the reservoir and river will probably increase and river bottom and prairie habitat will be destroyed.	User Benefits $8,410,000 Regional Benefits $16,233,800 Net Benefits $18,297,800	The project will provide employment benefits to area residents due to agricultural and industrial benefits the reservoir will make possible. With economic growth some social problems may occur as the area becomes more populated, health, transportation, and education systems will be under stress.
FLOOD CONTROL **Miles City Levee** Corps of Engineers Yellowstone Level B Custer County	First Cost $5,170,000 Annual Benefits $442,000 Annual Cost $363,000	Better drainage and mosquito control. Reduce wildlife habitat due to 18 acres of clearing and grubbing	User Benefits $442,000 Regional Benefits $1,224,000 Net Benefits $1,303,000	Protection of 9,000 residents from flooding and related health problems and 1,300 acres protected from flooding

LAND CONSERVATION **Accelerated Land Conservation** A. State and Private Lands—639,000 Acres B. National Resource Lands— 78,000 Acres C. Forest Service Lands—4,300 Acres	A. Cap. Cost $7,653,000 *Ann. Equiv. Cost $620,200 B. Cap. Cost $982,000 *Ann. Equiv. Cost $79,600 C. Cap. Cost $1,119,000 *Ann. Equiv. Cost $90,700 Annual Benefits—not computed - assumed to be at least equal to cost *6⅜ percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover resulting from improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries Reduce soil nutrients from entering streams and the underground water table Reduction of undesirable return flow to streams.	Maintain and enhance the output of goods and services to users in the region Provide additional employment in the application and maintenance of proposed measures Provide additional permanent employment in processing increased goods and services.	Improved downstream water quality for all uses. Improve general esthetics of the land
ENERGY **Tongue River Power Plant—6 MW, 21 gigawatts**	Included under Tongue River Reservoir Modification Project (see above)	See Tongue River Reservoir Modification Project above	See Tongue River Reservoir Modification Project above	See Tongue River Reservoir Modification Project above
NED Energy development	Private Capital Costs $2,923,200,000 Annual Benefits $589,060,000 Annual Cost $500,960,000	The NED is an export-only scenario using rail and slurry to move coal out of the basin. Mine, reclamation, and slurry water requirements will total 17,400 acre-feet by 1985 and 68,400 by the year 2000 Nearly 6,100 acres of land will have been affected by strip mining by the year 2000. The value of the reclaimed land will be dependent on the level of success of the reclamation program	Regional benefits are not available, it may be assumed that net benefits would increase substantially	The NED plan is an export only approach with no population impacts from thermal electric generation or coal gasification. Increased mining activities will have an impact and add to social pressures. there will also be increased employment opportunities associated with expanded mining operations.

TABLE 40
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, LOWER YELLOWSTONE

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
AGRICULTURE (Irrigation) **Conns Coulee Unit** USBR Single-purpose Irrigation Study Yellowstone River Basin Prairie County	First Cost $3,132,000 Annual Benefits $288,100 Annual Cost $225,700	Mostly cultivated at present and there are no wildlife problems anticipated	User Benefits $288,100 Regional Benefits $173,500 Net Benefits $235,900	Reduce outmigration and increase and stabilize income to the agricultural community Influx of approximately 53 construction workers and their families with 18 school-age children for two years.
Haley Unit USBR Single-purpose Irrigation Study Yellowstone River Basin Prairie County	First Cost $3,138,000 Annual Benefits $253,100 Annual Cost $218,300	Some improved habitat for upland game birds. Unit lands and adjacent BLM lands are good habitat for deer, sharp-tail grouse, and antelope; any new development will have a very adverse effect on wildlife.	User Benefits $253,100 Regional Benefits $475,600 Net Benefits $510,400	Reduce outmigration and increase and stabilize income to the agricultural community. Influx of approximately 35 construction workers and their families with 10 school-age children for two years.
Marsh Unit USBR Single-purpose Irrigation Study Yellowstone River Basin Dawson County	First Cost $3,632,000 Annual Benefits $294,400 Annual Cost $253,000	No great increase in deer damage is likely, but it is believed that a substantial amount of sharp-tail grouse habitat will be lost including some strutting grounds.	User Benefits $294,400 Regional Benefits $553,300 Net Benefits $594,700	Reduce outmigration and increase and stabilize income to the agricultural community Influx of approximately 40 construction workers and their families with 15 school-age children for two years.
Fox Creek South Unit USBR Single-purpose Irrigation Study Yellowstone River Basin Richland County	First Cost $1,661,000 Annual Benefits $156,800 Annual Cost $106,100	The area is presently under cultivation and no major wildlife problems or changes in species or numbers are likely to occur.	User Benefits $156,800 Regional Benefits $310,400 Net Benefits $361,100	Reduce outmigration and increase and stabilize income to the agricultural community. Influx of approximately 31 construction workers and their families with 10 school-age children for two years.
Seven Sisters Unit USBR Pick-Sloan Missouri Basin Program Richland County	First Cost $4,428,000 Annual Benefits $342,000 Annual Cost $307,400	The area is presently under cultivation and no major wildlife problems or changes in species or numbers are likely to occur.	User Benefits $342,000 Regional Benefits $645,300 Net Benefits $679,900	Stabilize local agricultural economy. Influx of approximately 50 construction workers and their families with 10 school-age children.

LAND CONSERVATION **Accelerated Land Conservation** A. State and Private Lands 1,551,000 Acres B. National Resource Lands 251,500 Acres C. Forest Service Lands 700 Acres	A Cap. Cost $33,728,000 *Ann. Equiv. Cost $2,733,300 B Cap. Cost $2,855,000 *Ann. Equiv. Cost $231,400 Cap. Cost $87,000 *Ann. Equiv. Cost $7,100 Annual Benefits—not computed—assumed to be at least equal to costs. *6⅜ percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover resulting from improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams. Increased fire hazard from added production of forage plant species.	Maintain and enhance the output of goods and services to users in the region. Provide additional employment in the application and maintenance of proposed measures. Provide additional permanent employment in processing increased goods and services.	Improved downstream water quality for all uses. Improve general esthetics of the land.
RECREATION **Yellowstone River** Establish national scenic and recreational designation for the lower Yellowstone from Pompeys Pillar to the Montana-North Dakota border for 260 miles.	First Cost $41,068,000 Annual Benefits $4,056,000 Annual Cost $3,636,200	The natural beauty along these reaches of streams will be preserved for present and future generations, water quality will be improved, flora and fauna habitat values will be protected, and a higher level of recreation will be offset by the protection of resources.	Tourism is a major contributor to the area and State economies. Recreational benefits resulting from preservation of these river reaches are in the State-regional interest. Other analysis is not available.	The pleasures associated with river-oriented recreation are important to social well-being Local residents as well as tourists relax and revitalize themselves through their association with the pleasures provided by nature
ENERGY **NED Energy Development**	Private Capital Costs $1,311,200,000 Annual Benefits $772,970,000 Annual Cost $657,290,000	Two additional coal-fired plants are built at Colstrip (3 and 4) which may increase air pollution emissions over present levels. No gasification plants will be built. All but 9 million tons of coal per year is exported either by slurry or rail. Water requirements will jump to nearly 86,000 acre-feet per year by 2000. The bulk of water is used in thermal electric and slurry operations, although slurry operations are about seven times more water efficient.	Regional benefits are not available: it may be assumed that net benefits would increase substantially	Increased employment in the energy sector of a predominantly agricultural area and secondary economic effects to local business Additional social, educational and health stresses on existing institutions.

TABLE 41
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, NORTH DAKOTA TRIBUTARIES

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
MULTIPURPOSE **Cannonball Unit** Alternative No. 1—USBR The dam and reservoir on the Cannonball River provides water for 5,000 acres of new irrigation, 163,000 acre-feet of flood control storage, and 19,000 acre-feet annually for municipal, rural, and industrial use.	First Cost $20,254,000 Annual Benefits $4,367,000 Annual Cost $1,631,500	A reservoir of 3,150 acres (conservation level) will be created, a fishery reservoir will be created, slightly improving fishery in the river below the dam; irrigation development could provide better interspersion of food and cover for pheasants; visual quality from irrigation facilities will be reduced, several miles of free-flowing stream will be impounded, and there will be heavy sedimentation on the reservoir.	Total Benefits $5,479,000 Total Adverse Effects $1,825,000	A slight redistribution of income will occur, flood control and additional recreation areas will be provided, associated industrial development could increase the local population; and for a 4-year period the construction population will total 225 persons with an estimated 77 school-age children.
Thunderhawk Unit Alternative No. 1—USBR The dam and reservoir on Cedar Creek provides water for 2,400 acres of new irrigation, 210,000 acre-feet of flood control storage, and 11,000 acre-feet annually for municipal, rural, and industrial use.	First Cost $16,310,000 Annual Benefits $2,441,000 Annual Cost $1,555,000	A reservoir of 3,100 acres (conservation level) will be created, a fishery reservoir will be created, slightly improving fishery in the river below the dam; irigation development could provide better interspersion of food and cover for pheasants; visual quality from irrigation facilities will be reduced; several miles of free-flowing stream will be impounded; and there will be heavy sedimentation on the reservoir.	Total Benefits $3,373,000 Total Adverse Effects $1,664,000	A slight redistribution of income will occur; flood control and additional recreation areas will be provided, associated industrial development could increase the local population; and for a 4-year period the construction population will total 167 persons with an estimated 57 school-age children
Broncho Reservoir Alternative—USBR The dam and reservoir on the Knife River provides water for 5,000 acres of new irrigation, 40,000 acre-feet of flood control storage, and 15,000 acre-feet annually for municipal, rural, and industrial use.	First Cost $34,014,000 Annual Benefits $3,511,000 Annual Cost $2,599,000	Up to 4,650 acres will be inundated by the reservoir; visual quality from irrigation facilities will be reduced, several miles of free-flowing stream will be impounded; there will be heavy sedimentation on the reservoir, and fishing below the dam will be slightly improved	Total Benefits $5,689,000 Total Adverse Effects $2,712,000	Irrigation will help stabilize rural population; over a 5-year period construction will increase the population by 250, 23,000 acres will be provided for flood protection; aditional recreation areas will be provided, associated industrial development will increase the local population by 200 people; and an estimated 280 school-age children will be added to local schools. Irrigation and dam-related works will affect some lands where owners will not receive any benefits from the project.

FLOOD CONTROL **Hazen Flood Control—SCS** Provides protection to Hazen from flooding of the Antelope Creek	First Cost $160,000 Annual Benefits $40,000 Annual Cost $17,100	Air pollution will be increased slightly during project construction and channel relocation will cause a temporary increase in downstream bank erosion.	Total Benefits $43,344 Total Adverse Effects $7,209	Create 18 skilled jobs for 90 days and 30 man-days of part-time employment for local residents each year, and provide an estimated 95 percent reduction of flood damages to the flood plain
ENERGY **NED Energy Development Scenario** Coal production of 20.71 million tons per year by 1985 and 164.88 million tons per year by 2000.	First Cost $3,770,000,000 Annual Benefits $584,500,000 Annual Cost $497,240,000	Energy-related facilities will impose long-term obtrusions to the visual quality of the area; anticipated increases in major facilities from 1975 to 2000 include an addition of 6,359 megawatts; land requirements for these facility sites will total 8,873 acres and 4,946 acres for mine sites, by the year 2000; strip mining will affect 6,315 acres per year by 2000, areas surrounding and downwind of energy conversion plants will be subjected to low levels of aerial contaminants over a long period of time; the value of the reclaimed lands will be dependent on the level of success of the reclamation program; and water requirements will total 210,628 acre-feet per year by 2000.	Total Benefits Not Available Total Adverse Effects Not Available	Not Available
RECREATION Missouri River—NPS (75 miles of free-flowing stream below Garrison Dam-national designation)	First Cost $11,806,000 Annual Benefits $1,237,500 Annual Cost $1,108,595	Maintain scenic, recreational, and wildlife options by preservation of 75 miles of free-flowing streams from ll miles downstream of Garrison Dam to the mouth of the Heart River at Fort Lincoln State Park	Not Available	Land ownership and control will be regulated by the purchase of 16 acres in fee title and 18,920 acres of easement

TABLE 41, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, NORTH DAKOTA TRIBUTARIES

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
HYDROELECTRIC POWER **Additional hydropower at Garrison Dam—COE**	First Cost $90,748,000 Annual Benefits $9,604,000 Annual Cost $6,070,000	Fluctuations in power plant releases would be reduced by a reregulating reservoir. Loss of about 200 acres of terrestrial habitat bordering the river due to a one-time bank slope adjustment; this loss will be mitigated by acquisition of 275 acres of similar habitat	Total Benefits Not Available Total Adverse Effects Not Available	Retail and service activities stimulated by employment of 290 construction workers, value of housing temporarily inflated in nearby communities, and OM&R employment of 5 persons added
LAND CONSERVATION **Accelerated Land Conservation—SCS** A. State and Private Lands 1,787,000 Acres B. National Resource Lands 14,000 Acres C. Forest Service Lands 5,500 Acres	A. Cap. Cost $49,573,000 *Ann. Equiv. Cost $4,017,400 B. Cap. Cost $140,000 *Ann. Equiv. Cost $11,300 C. Cap. Cost $1,198,000 *Ann. Equiv. Cost $97,100 Annual Benefits—not computed—assumed to be at least equal to costs. *6⅜ percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover resulting from improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams.	Maintain and enhance the output of goods and services to users in the region Provide additional employment in the application and maintenance of proposed measures Provide additional permanent employment in processing increased goods and services	Improved downstream water quality for all uses Improve general esthetics of the land

TABLE 42
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
MULTIPURPOSE **Upper Badwater Creek Project** Irrigation, flood control, sediment control, and other purposes A 1,170 acre-foot reservoir on Badwater Creek will provide supplemental supplies to 1,700 irrigated acres. Floods and resulting erosion will be decreased along the main stem of Badwater Creek.	First Cost $775,200 Total Annual Cost $51,150 Annual Benefits $56,700	*WIND RIVER BASIN* Waterfowl habitat will be provided at a reservoir with a maximum surface area of 70 acres; improved water supplies will permit better water management to reduce erosion from irrigated land, about 70 acres of rangeland will be inundated, and erosion will be increased during the construction and revegetation period on about 100 acres of land	State-regional benefits from employment, induced and stemming from activities, and net externalities will amount to $109,300; losses to the rest of the Nation will amount to $31,200.	Net income on 4 ranches would be increased about $36,000 annually, and ranch income would be stabilized by the improved reliability of water supply. Community income would increase $140,000 annually, and would be stabilized. The project would generate 3 full-time jobs, and would provide part-time employment for several additional people. The project will permit the improvement of the communities social, cultural, and recreational facilities. The project will provide a needed source of water for fire fighting, and will reduce fire hazards by extending the green vegetation season.
Upper Beaver Creek Project Irrigation, flood control, sediment control, and other purposes - SCS A 14,500 acre-foot reservoir will provide storage for a supplemental irrigation water supply for 1,213 acres of land and storage for a full water supply for 1,587 acres. Flood control and sediment storage space is provided in the reservoir. An existing canal will be enlarged for a distance of seven miles, and an 8-mile extension will be constructed	First Cost $1,500,000 Total Annual Cost $120,100 Annual Benefits $175,700	Waterfowl habitat will be provided in a 400-acre reservoir area, the reservoir will have a permanent pool and provide a fish habitat, flows below the reservoir will be increased during low-flow periods and decreased during high-flow periods, about 1,600 acres of nonirrigated hayland and rangeland will be converted to irrigated cropland, and 400 acres will be inundated; and erosion will be increased during the construction and revegetation period on about 500 acres of land, but may be decreased thereafter	Employment impacts and induced and stemming from activities will increase the project benefits to $235,250, although $52,500 of the regional gains will be offset by losses to the rest of the Nation	Net income on 5 ranches will be increased about $100,000 annually, and the ranchers annual income will be stabilized because of the improved reliability of crop production. Community income will be increased approximately $365,000 per year, and will also be stabilized. Seventeen new full-time jobs will be generated, and part-time help requirements will alleviate underemployment problems. The improved water supply will provide a needed source of fire- fighting water. The increased income will permit beneficiaries to more actively participate in social, cultural recreationsl, and community activities of the region

TABLE 42, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Crow Creek Project Irrigation and flood control—SCS A 10,000 acre-foot reservoir, will provide 5,900 acre-feet for irrigation and 4,100 acre-feet for silt detention and flood control. A 5-mile long canal will provide supplemental suppies to 1,200 acres of land and full suppies to 2,600 acres of land. The land is privately owned within Wind River Indian Reservation.	First Cost $1,212,700 Annual Equiv. Cost $80,000 Annual Benefits $151,850	Waterfowl habitat will be provided in a 200-acre reservoir area, late season irrigation will increase the amount and duration of green forage for deer and antelope, possibly at some expense to the State for crop damage claims; improved water supply and irrigation will permit better water management to reduce erosion from irrigated cropland; about 250 acres of rangeland will be converted to storage use, and 2,600 will be converted to irrigated hay and pasture; erosion will be increased during the construction and revegetation period on about 300 acres of land, and water depletions will be increased about 6,500 acre-feet per year.	Employment impacts and induced benefits will increase the total benefits to $265,900 annually	The net income on 13 ranches will be increased by about $113,000 annually, and the ranch income will be stabilized. Community income will increase about $360,000 annually because of increased employment and business generated by the project, and community income will be stabilized by a more dependable agricultural base. Project operation and maintenance and other project-related economic activities will provide about 17 full-time jobs in the community and will more fully utilize underemployed labor resources in the community for part-time jobs. Increased incomes will permit improved social services and water will be available for firefighting and other uses. The flood threat will be reduced, providing increased security for downstream operations.
Sand Mesa Project Wildlife habitat and irrigation—Wyoming Two small reservoirs for wildlife habitat and 1,690 acres of sprinkler irrigation will provide wildlife feed crops or be harvested as circumstances dictate each year.	First Cost $1,429,000 Annual Equiv. Cost $99,500 Annual Benefits $149,800	Farming of the area could leave large areas exposed to wind erosion during the fall, winter, and spring. The SCS soils classification shows that the predominant soils of the area are prone to wind erosion. The two small reservoirs will provide nesting habitat for Canadian geese that is expected to result in the annual production of about 250-300 goslings per year by 1982. The ponds will also provide resting areas for migrant waterfowl and the irrigated area will provide a more accessible feed supply for the waterfowl. Unharvested crops and fringe areas will provide habitat necessary for increased	In addition to the direct user (NED) benefits, the project will generate employment benefits of about $62,000 annually, and induced and stemming from benefits of about $162,000; the regional cost-benefit ratio will be about 2.7 to 1.	The increased irrigated acreage will increase the total agricultural returns to the area by about $120,000 per year. Community income will increase about $224,500 annually due to increased employment and business generated by the project installations and operations. The project installation, operation, and maintenance will provide increased full-time employment, and increased agricultural output will create new seasonal on-farm jobs and generate additional full-time jobs in the agribusiness industry of the region. The enhanced wildlife production will provide the base for increased

		production of pheasants, Hungarian partridge, and other upland game and songbirds.		employment in the service sectors dealing with tourism and hunting; therefore, increased wildlife population will provide increased opportunity for viewing wildlife as well as increase hunting. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.
AGRICULTURE (Irrigation) **Hidden Valley Project** Irrigation—SCS A 300 acre-foot reservoir located along the Pilot Canal will provide storage for surplus flows during periods of low demand and for release during periods of high demand when a full supply is not available from regular flows in the canal. A supplemental water supply would be provided to 2,362 acres. The project will not affect the amount of diversion into Pilot Canal.	First Cost $325,000 Total Annual Cost $21,900 Annual Benefits $114,200	The storage reservoir will provide waterfowl habitat on 4 to 18 acres; improved irrigation management will reduce erosion on about 2,000 acres of irrigated land; about 20 acres of land will be converted from rangeland to water storage use; erosion will be increased during the construction and revegetation period on about 20 acres of land; and water depletions will be increased about 300 acre-feet per year.	Employment impacts, induced and stemming from benefits, and net externalities less related costs will result in a net regional benefit of about $255,000; these benefits will be partially offset by $12,200 of losses to the rest of the Nation.	The net income on about 10 ranches will be increased by about $104,000 annually and the ranch income will be stabilized by the improved water supply. Community income will increase about $315,000 annually due to increased employment and business generated by the project and will be stabilized by the improved reliability of agricultural income. The project will generate about 14 full-time jobs in the community and provide better use of the area's underemployed resources.
Muddy Ridge Area Irrigation—USBR Provide irrigation water to an undeveloped portion of the third division of the existing Riverton Unit. A gravity system would supply water from the Wyoming Canal to 9,000 irrigable acres. An additional 9,000 acres for potential sprinkler irrigation may be provided by capturing and reusing drainage water from a currently operating portion of the Riverton Unit	First Cost $13,000,000 Total Annual Cost $895,000 Annual Benefits $910,000	The project will create potential for improved upland game hunting. Drains, canals, and other features of the irrigation systems will provide increased habitat for small aquatic furbearing animals and upland game birds. Irrigation will increase the value and productivity of the land due to the use of irrigation in the dry months. The project will create a visual effect of irrigation facilities, lands, and drains. The change in terrain due to irrigation and new farming methods will change the natural habitat for wildlife. Return flows will increase the amount of silt deposited in the Boysen Reservoir.	In addition to the NED benefits, the project will generate $1,626,859 as a result of increased employment income, induced business in the region, and other secondary effects.	Fremont County has one of the highest unemployment rates in Wyoming and has had a decrease in rural population. The project will encourage 75 to 100 additional farm families to move into or remain in the area. The project will provide work for 40 construction-related people during the 4-year construction period. Ranch and community income will become stabilized by more dependable agricultural production. Some landowners may have irrigation features cross their land and not receive benefits from the irrigation

TABLE 42, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Taylor-Dutch Flat Project Irrigation—SCS The existing Taylor, Dutch Flat, and Cemetery ditches would be combined into a concrete-lined canal, and other system improvements would be made in the water supply system for 3,000 acres.	First Cost $169,200 Total Annual Cost $15,390 Annual Benefits $40,140	Erosion will be decreased as banks are stabilized and seepage problems reduced, alkaline soil conditions caused by canal seepage may be reduced over time; and the amount of land used for ditches would be reduced slightly by combining and lining two ditches through a 2-mile stretch. Some undetermined reduction on wetland habitat will result.	In addition to the NED benefits, regional benefits (net) from employment impacts, induced and stemming from activities, and externalities will amount to $72,940 annually, losses to the rest of the Nation will amount to $7,410 annually	The net income on 20 ranches will be increased by about $32,000 annually and the ranch income will be stabilized by more reliable crop production. Community income will increase an average of $100,000 annually due to increased employment and business activity generated by the project and will be stabilized. The project will generate about five new full-time jobs and better use would be made of the areas underemployed resources because some part-time labor would be needed.
RECREATION **Popo Agie River Recreation** Scenic and Recreational River—FS Component 1—the north, middle, and Little Popo Agie above the national forest boundary Designate these streams as national, scenic, and recreational rivers, under Forest Service management; add one minor access area.	First Cost $60,000 Annual Equiv. Cost $45,400 Annual Benefits $78,100[a] [a] Does not include fish and wildlife benefits.	The scenic beauty along 29 miles of the designated scenic and recreational river will be preserved and managed by the U.S. Forest Service as a free-flowing stream. A higher level of recreation is offset by the protection of resources, interpretation will enhance public use value; present or future endangered or threatened species of wildlife and vegetation will be identified and protected; water quality will be improved due to increased and improved sanitary facilities; State standards will be met; scenic, recreational, and wildlife options will be maintained; scenic and recreational values will be preserved and enhanced, and future development choices will be lost.	In addition to the NED benefits, the project will generate $35,000 in regional benefits as a result of increased employment benefits and $75,000 as a result of induced business in the area and other secondary effects.	The project with its new facilities will relieve pressure on existing facilities and provide for a better quality of recreational experience Operation and maintenance of new facilities will create additional part-time jobs. Local business establishments will profit from increased tourist trade.
MULTIPURPOSE **Buffalo Bill Enlargement[a]** Multipurpose—USBR Raising Buffalo Bill Dam 25 feet from its present height of 5,370 feet will provide a firm yield of 74,000 acre-feet annually for multipurpose uses. The total regulated storage capacity will be	First Cost $30,669,000 Total Annual Cost $2,182,000 Annual Benefits $2,568,000	*BIGHORN BASIN* Fishing opportunities on and below the reservoir will be increased by 9,700 fisherman-days. About 1,600 acres of irrigated land and 520 acres of pastureland will be converted to water storage use. Public and private recreational facilities will be relocated and improved The dam has been	In addition to the NED benefits, regional employment benefits of $1,559,000 and regional induced and stemming from benefits of $341,000 will accrue.	Employment of construction workers will vary from 20 to 250 during the 5-year construction period. Most workers will be imported, but some semiskilled and unskilled workers will be employed from local forces. School-age children of construction workers could

increased 271,300 acre-feet for a total of 695,400 acre-feet. The maximum surface area will be increased from 6,691 acres to 9,780 acres. The existing 5.6 megawatt Shoshone powerplant is obsolete and will be replaced with a new powerplant with a capacity of 20 megawatts. The spillway capacity will be enlarged from 18,000 cfs to 66,850 cfs. Water releases through Heart Mountain will allow an additional annual generation of 14.9 million kilowatt hours. A visitor center will be constructed at the left abutment of the raised dam.		declared a national historic landmark and modification will alter it somewhat, but will prevent its overtopping during maximum probable flood conditions. Seven archaeological sites in the reservoir area could be altered by preconstruction investigation and excavation as appropriate. Minimum flows between the dam and the Heart Mountain Powerplant will be increased from 50 to 100 cubic feet per second and from 50 to 250 cubic feet per second be'ow the powerplant. The shoreline will be increased 4 miles, and the water surface area will be increased a normal maximum of 3,089 acres. The loss of inundated vegetation will result in a loss of wildlife population and the North Fork and South Fork of the Shoshone River will have 1.3 and 0 6 miles, respectively, inundated. The enlargement will decrease flood hazards and flood losses below the dam.		number from 20 to 200 during the 5-year construction period. Local schools will have to accomodate these students. Persons on fixed incomes could have reduced buying power if local prices increase during construction activity. Visitor centers with audio and visual displays will provide historical and cultural information about the dam, reservoir, and surrounding area.
Cody Canal Rehabilitation Irrigation and other purposes—SCS The project involves rehabilitation of the Cody Canal, construction of a delivery canal from the Heart Mountain Tunnel bifurcation works to the Cody Canal near Sulphur Creek, and provision of facilities to serve 2,000 acres of new irrigation; further studies may indicate the same.	First Cost $3,067,500 Total Annual Cost $298,000 Annual Benefits $382,600	Land use and cover on about 2,000 acres will be converted from nonirrigated range to irrigated hay, pasture, and grain. About 20 acres of range would be converted to canal use. The increased irrigation will create an additional consumptive use of about 4,500 acre-feet per year, but this will not materially affect streamflows because of the flow regulation at the Buffalo Bill Dam. The potential for recreational development at Beck Lake will be enhanced and the water supply system for the City of Cody will be assured of needed supplies. Stream depletion will be increased by 4,500 acre-feet per year	State-regional benefits, in addition to those listed under the NED account, would be: Employment impact $143,000 Induced benefits $682,000 Externalities $42,000 $867,000 About $107,100 of these benefits will accrue to areas outside of the Yellowstone Basin.	The net ranch income will be stabilized and increase by $150,000 annually due to the improved reliability of crop production. Community income will increase $1,000,000 annually due to increased employment and business generated by the project and will be stabilized. The project will generate about 53 new jobs in the community and the need for some part-time help will result in better use of the underemployed. Additional water will be available for firefighting, and rural fire hazards will be reduced by prolonging the period of green vegetation. Increased income will permit more participation in social, cultural, recreational, and community activities. An added potential for recreational development will be provided at Beck Lake.

[a] This enlargement will provide additional water for many purposes including irrigation, instream flow, municipal and industrial supply, and power. Development should be designed to provide optimum benefits to the Cody area

TABLE 42, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Gooseberry Creek Project Irrigation and other purposes—SCS A 3,700 acre-foot off-stream reservoir will be supplied by a feeder canal from Gooseberry Creek to provide a supplemental water supply to 2,100 acres. A small diversion dam will be required and water will be delivered to the land through existing systems.	Total Cost $1,123,300 Total Annual Cost $74,900 Annual Benefits $106,500	Waterfowl habitat will be provided at a reservoir with a maximum surface area of 150 acres. Late season irrigation will provide additional green forage that will benefit wildlife on 2,610 acres. Improved water supplies will permit better water management to reduce erosion on irrigated land. About 200 acres of rangeland will be converted to storage use. Erosion will be increased during the construction period on about 100 acres of land. A 2-mile long canal might limit some wildlife movement, but will also provide increased wildlife forage.	In addition to the NED benefits, the project will generate $104,500 in regional benefits as a result of increased employment income and induced business in the region, these benefits will be partially offset by losses of $35,800 to the rest of the Nation.	The net income on 22 ranches will be increased by $55,000 annually and the ranchers' income will be stabilized by more reliable production. Community income will increase about $200,000 annually and will be more reliable. The project will generate about 11 new jobs in the community and some additional part-time help will be needed. Increased income will permit more participation in social, cultural, recreational, and community activities. The reservoir will provide a needed reliable source of firefighting water, and rural fire hazards will be reduced by prolonging the period of green vegetation.
Lower Greybull River Drainage—SCS A drainage system including both open and closed drains to provide drainage for 21,200 acres of irrigated land that is suffering from decreased production.	First Cost $5,265,000 Total Annual Cost $380,400 Annual Benefits $933,200	After initial drainage, return flows should contain a lower concentration of soluble salts. About 6,000 acres of wet pasture will become available for cultivation. Recreational and wildlife values will be protected and probably enhanced.	In addition to the NED benefits, the project will generate $1,599,300 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	The net income on 175 ranches will be increased by about $760,000 annually and community income will be increased an average of $2,500,000 annually because of increased employment and business generated by the project. Ranch and community income will be stabilized by more dependable agricultural production. Project installation will create about 45 full-time jobs and about 65 seasonal on-farm jobs. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities, and make wildlife activities more available to residents.
Nowood River Project Irrigation, flood protection, and recreation—SCS An 18,000 acre-foot storage structure will provide irrigation	First Cost $1,018,000 Total Annual Cost $98,100 Annual Benefits $192,100	Irrigation water storage will provide habitat for waterfowl and fish and increase green forage for wildlife. Streambank erosion and improved water quality will result. Erosion will be increased during the	In addition to the NED benefits, the project will generate $154,800 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects; the	The net ranch income will be increased by about $130,000 annually and community income will be increased by nearly $310,000 annually. Ranch and community income will be stabilized by more dependable

water for 3,000 acres, reduce streambank erosion, provide recreation opportunities, and provide flood protection.		construction and revegetation period on about 200 acres of land. About 3,000 acres of rangeland will be converted to irrigated land, 160 acres from irrigated to reservoir use, and 300 acres from rangeland to reservoir use. Streamflow depletions will increase by about 7,000 acre-feet per year.	State may be obliged to pay additional claims for crop damage as a result of increased wildlife.	agricultural production. Project installation will create about six full-time jobs and seven seasonal on-farm jobs. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region. Increased irrigation water supply will serve as a source of firefighting water.
AGRICULTURE (Irrigation) **Bighorn Unit**[a] Irrigation The Bighorn Unit will supply irrigation water for 1,730 acres of irrigable land in two separate areas. The project would require three pumping plants. The Bighorn Canal would be enlarged to provide additional capacity of 35 cubic feet per second in addition to its present capacity of 450 cubic feet per second. Enlarging the canal would involve some widening of short reaches, building up the lower bank, cleaning, and improving or replacing major structures.	**Bighorn Unit-Area No. 1** First Cost $1,794,000 Total Annual Cost $117,100 Annual Benefits $123,600 **Bighorn Unit-Area No. 2** First Cost $1,132,400 Total Annual Cost $76,500 Annual Benefits $125,700	Water quality will be affected by an increase in salinity due to return flows. Some upland game bird habitat and some aquatic furbearing animal habitat will be created in canals and laterals. Waste grains will provide waterfowl food. Strutting grounds of sage grouse will be eliminated in irrigated areas. The project will create visual effects of canals, laterals, diversion dams, pumping plants, and access roads.	The project will generate $234,300 in regional benefits from Bighorn Unit-Area No. I as a result of increased employment income, induced business in the region, and other secondary effects; the corresponding regional benefits for Bighorn Unit-Area No. 2 are $241,800.	Employment of construction workers will vary from 5 to 60 during a 2-year or longer construction period. Some workers will be imported but most workers will be hired from the local and adjacent areas. Area schools will have to accommodate children of the imported workers. Persons on fixed incomes could have reduced buying power if local prices increase during construction activity. There will be an increase in commercial facilities and services needed to supply the requirements of increased irrigation farming and to process the increased produce. Satisfying these needs will strengthen the employment base in the area.
Cody Pump Area Irrigation Two pumping plants, one a relift plant, would pump water from Heart Mountain Canal to supply 510 acres with irrigation water. Other structures involved would be a lateral and a channel connecting the two plants, and a lateral for discharge from the second plant. Waste water would be carried under the Heart Mountain Canal through two existing drainage culverts.	First Cost $532,700 Total Annual Cost $37,200 Annual Benefits $73,300	Water quality will be affected by an increase in salinity due to return flows. Some upland game bird habitat and some aquatic furbearing animal habitat will be created in canals and laterals. Waste grains will provide waterfowl food. Strutting grounds of sage grouse will be eliminated in irrigated areas. The project will create the visual effects of canals, laterals, diversion dams, pumping plants, and access roads.	In addition to the NED benefits, the project will generate $32,100 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	Employment of workers will vary from 5 to 15 during the construction period. Most workers would be from local and adjacent areas. The project will add its share to the demand for services and commercial facilities needed to supply the requirements of increased irrigation farming.

[a] This unit is a part of the larger Westside Project. It would be built independently if the Westside Project is not recommended.

TABLE 42, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Crooked Creek Project Irrigation—SCS The project involves drilling of up to ten deep wells to provide supplemental irrigation water to 1,400 acres of land.	First Cost $317,000 Total Annual Cost $25,300 Annual Benefits $32,200	Summer streamflow would be increased in about 8 miles of Crooked Creek. Land use and cover will change from dry rangeland to irrigated hayland on about 250 acres. Streamflows will be depleted by about 1,000 acre-feet per year	In addition to the NED benefits, the project will generate $65,400 in regional benefits from labor impacts, induced business, and other factors	The net income on 6 ranches will be increased by about $16,600 annually and the ranch income will be stabilized by more reliable crop production. Community income will increase by about $80,000 annually and will be stabilized by improved crop production. The development will result in four new full-time jobs and a need for additional part-time help. Increased income will permit beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region
Greybull Flat Unit Irrigation—USBR A single pumping plant with two electrically driven pumps would pump water from the Bighorn River to 980 acres which are subdivided into seven farm units of irrigable land. Water would be discharged into a canal that would extend 3.2 miles and have an initial capacity of 20 cubic feet per second. The only major structure in the canal would be a siphon across a coulee.	First Cost $887,200 Total Annual Cost $63,200 Annual Benefits $140,800	Water quality will be affected by an increase in salinity due to return flows. Some upland game bird habitat and some aquatic furbearing animal habitat will be created in canals and laterals. Waste grains will provide waterfowl food. Strutting grounds of sage grouse will be eliminated in irrigated areas. The project would create the visual effects of canals, laterals, diversion dams, pumping plants, and access roads	In addition to the NED benefits, the project will generate $257,100 in employment and induced and stemming from benefits.	Employment of construction workers will vary from 5 to 20 during the 21-month or longer construction period. Most workers will be from local and adjacent areas. The project will add its share to the demand for services and commercial facilities needed to supply the requirements of increased irrigated farming.
Lakeview Canal Rehabilitation Irrigation—SCS Six major structures would replace about 3 miles of canal and 3 miles of lateral would be lined. Canal stabilization and delivery structures would be improved for the benefit of about 9,000 acres of irrigated land.	Total Cost $1,248,000 Total Annual Cost $108,570 Annual Benefits $114,890	About 3 miles of canal and 3 miles of lateral presently in partially vegetated condition will be lined with concrete and short sections of laterals will be replaced with conduit. Return flow from canal seepage will be decreased, but total depletions will not be materially affected.	The project will generate about $128,280 of regional benefits annually, in addition to the NED benefits; these benefits will be partially offset by a loss of $48,340 to the rest of the Nation.	The net ranch income will be increased by about $55,000 annually, community income will increase by about $250,000 annually, and both incomes will be stabilized by the improved reliability of crop production. Fifteen new full-time jobs will result from the rehabilitation and there will be some added demand for part-time labor. Increased income will permit beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.

Lateral H-103 Improvement Irrigation—SCS Lateral H-103 on the Heart Mountain irrigation system would be converted to a closed-pipe system to improve water delivery and use efficiency and to provide pressurehead for sprinkling about 1,000 acres of land presently irrigated from a ditch system	Total Cost $600,000 Total Annual Cost $60,620 Annual Benefits $62,310	Open irrigation ditches and canals will be replaced with closed pipelines and sprinkler systems. Land surface currently used for open ditches will be cropped and seepage from canals will be eliminated.	In addition to the NED benefits, State-regional benefits from the project will amount to $19,700 annually; State-regional costs, however, will be $18,650.	The net income on 15 ranches will be increased by $25,000 annually and community income will be increased by $44,000 annually. The development will help stabilize the area and regional economy through more reliable crop production. Eight new jobs will be created and some part-time help needs will alleviate underemployment conditions in the area. Increased income will permit beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region
Lateral R-9N Improvement Irrigation—SCS About 15,000 feet of concrete canal lining and 1,700 feet of buried pipe will be installed to replace existing canals. Improved management practices including land leveling will be instigated. NOTE. This improvement was being installed in 1976 and 1977. It is included here because it had not been undertaken at the time the study was initiated.	Total Cost $332,700 First Annual Cost $10,450 Annual Benefits $12,635	Areas of natural beauty will be enhanced by reduced weed growth on canal banks, elimination of spoil banks, and revegetation of canal areas. Canal erosion will be reduced, the water table will be lowered on 33 acres, productivity will be enhanced, water losses and return flows will be reduced, and wildlife habitat along the canal banks will be stabilized. Some undetermined reduction in wetlands habitat will result.	In addition to the NED benefits, the project will generate $7,835 in net regional benefits as a result of increased employment income and economic stability	The net income of the area will be increased by $12,635 annually and the increased stability will benefit both the irrigators and the community in general.
Sage Creek-Prior Mountain Project Irrigation—SCS A 1,300 acre-foot reservoir will aid in the regulation of canal flow and delivery of water to 4,000 acres of irrigated land. About 852 acres will be provided with effective drainage	First Cost $1,361,700 Total Annual Cost $90,700 Annual Benefits $245,600	Irrigation water storage will provide habitat for waterfowl, but will commit about 150 acres of rangeland to water storage use. Streamflows will be depleted by 2,000 acre-feet per year.	In addition to the NED benefits, the project will generate $421,950 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects	Net ranch income will be increased by about $200,000 annually and community income will be increased by nearly $660,000 annually because of increased employment and business generated by the project. Project installation will create 12 full-time jobs and 18 seasonal on-farm jobs. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region. Increased irrigation water supply will serve as a source of firefighting water.

TABLE 42, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ACCOUNT: ENVIRONMENTAL QUALITY	ACCOUNT: STATE-REGIONAL DEVELOPMENT	ACCOUNT: SOCIAL WELL-BEING
Lower Shell Creek Project Irrigation—SCS Two off-stream water storage dams[a] will provide supplemental water supplies for 1,940 acres of irrigated land.	First Cost $738,300 First Annual Cost $49,800 Annual Benefits $81,100	Two water storage dams will provide waterfowl habitat. Late season irrigation water will increase green forage for wildlife. Erosion on irrigated cropland will be reduced. One hundred fifty acres of rangeland will be committed to water storage use. Erosion will be increased during the construction and revegetation period on about 100 acres of land.	In addition to the NED benefits, the project will generate $134,800 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	The net ranch income will be increased by about $57,000 annually and community income will be increased by about $215,000 annually because of increased employment and business generated by the project. Ranch and community income will be stabilized by more dependable agricultural production. Project installation will create five full-time jobs and six seasonal on-farm jobs. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.
Sidon Canal Rehabilitation Irrigation—SCS Rehabilitate and improve Sidon Canal including lining of selected reaches of canal and lateral, installing controls with metering devices, and replacing canal structures. About 12,000 acres of irrigated land would be benefitted.	First Cost $2,640,000 Total Annual Cost $231,780 Annual Benefits $325,810	About 2,000 acres of seeped land will be reclaimed. Some undetermined reduction in wetland habitat will result.	In addition to the NED benefits, the project will generate $495,360 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	The net ranch income will be increased by about $200,000 annually and community income will be increased by $800,000 annually because of increased employment and business generated by the project. Ranch and community income will be stabilized by more dependable agricultural production. Project installation will create 16 full-time jobs and 25 seasonal on-farm jobs. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.
Westside Irrigation Project[ab] Irrigation—Wyoming Sprinkler irrigation of 25,000 acres of land. Diversion is through three river pumping plants to the Bighorn Canal.	Total Investment $19,207,000 Annual Equivalent Cost Investment $1,227,000 OM&R $775,000 Total Annual Cost $2,002,000 Annual Benefits $2,300,000	About 25,000 acres of potential antelope and sage grouse habitat will be lost. Farming of the area will leave large areas exposed to wind erosion during the fall, winter, and spring. Increased crop acreage will	User Benefits $2,300,000 Regional Benefits Employment $673,000 Induced and Stemming From $3,510,400 Total Benefits $6,483,000	The project acreage will increase total agricultural returns to the farmers of the area. Community income will be increased by $4,481,000 annually because of increased employment and business generated by the project

[a] Estimates are based on off-stream storage below Shell Canyon. Ongoing studies suggest that storage above the canyon may be cheaper. Neither option will adversely affect classification of the main stream canyon area as a scenic or recreational river.

Lands lie above the Bighorn Canal and will be supplied by pressure-system pumping from the canal.		increase the upland game and songbird habitat. Increased crop acreage will allow longer crop rotation for disease control, particularly in sugar beets. Streamflow depletions will have an adverse effect on the quality of municipal water available to the basin in Wyoming The river might be dewatered for short stretches below the river pumping plants.	Adverse Effects Investment $1,227,000 OM&R $775,000 Total Cost $2,002,000 Net Beneficial Effects $4,481,600	installation and output Economic conditions of the area will be stabilized through increased service industry activity associated with irrigated agriculture. Project installation, operation, and maintenance will provide increased full-time employment in agriculture and create new seasonal on-farm jobs. Increased agricultural output will generate additional full-time jobs in the agribusiness industry of the region and generate additional full-time employment in the service sectors Increased income will allow beneficiaries to more actively participate in social, cultural recreational, and community activities of the region The project will provide added opportunities for young people to become farmers
RECREATION **North Fork Shoshone River** Recreation—FS Component 1—the north Absaroka wilderness boundary to the eastern national forest boundary is designated as a national, scenic, and recreational river Proposed administrative designation as a recreational river with two major access sites and one minor access area No land acquisition is necessary since this portion of the river flows entirely within Federal lands	First Cost $372 000 Annual Equiv. Cost $77,000 Annual Benefits $190,100	The scenic beauty along 26 miles of the designated scenic and recreational river will be preserved and managed by the U.S. Forest Service as a free-flowing stream. A higher level of recreation is offset by the protection of resources; interpretation will enhance public use value, present or future endangered or threatened wildlife or vegetative species will be identified and protected; water quality will be improved due to increased and improved sanitary facilities, State standards will be met, scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced, and future development choices will be lost	In addition to the NED benefits, the project will generate $65,000 as a result of increased employment income and $200,000 as a result of induced business in the region and other secondary effects	The river and its environment offer visitors recreational opportunities such as fishing, hunting, camping picnicking, sightseeing, river floating, nature study, and other water-related activities The pleasures associated with river-oriented recreation are important to social well-being Recreational opportunities along pleasant streams renew human vitality Many visitors bound for Yellowstone spend some time along the Shoshone River before entering the park Local business establishments will profit from increased tourist trade

[a] Ongoing rehabilitation work on the Bighorn Canal includes replacing a siphon with a new structure with enough capacity to carry the Westside water

[b] This project includes the land in the Bighorn Unit

TABLE 42, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ACCOUNT: ENVIRONMENTAL QUALITY	ACCOUNT: STATE-REGIONAL DEVELOPMENT	ACCOUNT: SOCIAL WELL BEING
Shell Creek (Wyoming) Recreation Source to Bighorn National Forest boundary is designated as a secnic or recreational river—FS Proposed administrative designation as a national scenic, or recreational river with one minor access area No land acquisition is necessary since this component flows entirely within Federal lands This stream might be considered for national designation as a scenic or recreational river with one minor access area.	First Cost $60,000 Annual Equiv Cost $38,400 Annual Benefits $66,400[a]	The scenic beauty along 26 miles of the designated scenic and recreational river will be preserved and managed by the U S Forest Service as a free-flowing stream A higher level of recreation is offset by the protection of resources, interpretation will enhance public use value, present or future endangered or threatened wildlife or vegetative species will be identified and protected; water quality will be improved due to increased and improved sanitary facilities, State standards will be met, scenic, recreational, and wildlife options will be maintained scenic and recreational values will be preserved and enhanced, and future development choices will be lost	In addition to the NED benefits the project will generate regional benefits in the amount of $45,000 as a result of increased employment income and $45,000 as a result of induced business in the region and other secondary effects	The project will give local residents the opportunity to fish picnic and have access to the stream Local business establishments will profit from increased tourist trade The project is located on a major national highway and will induce tourists to make use of the facilities and recreational opportunities and therefore, relieve some of the pressure placed on facilities near or in Yellowstone Park
		CLARKS FORK BASIN		
MULTIPURPOSE **Cyclone Bar Project** Irrigation, flood control, and sediment control—SCS A full season irrigation supply can be developed for 5,366 acres of land of which 2,076 acres presently receive a supplemental water supply by constructing a diversion system, a supply canal, a dam, and delivery canals for water storage and distribution.	First Cost $1,133,900 Total Annual Cost $107,300[a] Annual Benefits $175,500	Irrigation water storage will provide habitat for waterfowl, increase green forage for wildlife, and commit about 400 acres of rangeland to water storage and recreational use. About 3,000 acres of dry grassland will be converted to irrigated grassland. Recreational facilities will be provided in an area where such facilities are limited.	In addition to the NED benefits, the project will generate $220,150 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects, the State may be required to make crop damage payments as a result of increased wildlife	The net income on 20 ranches will be increased by about $105,000 annually and community income will be increased by $360,000 annually because of increased employment and business generated by the project Ranch and community incomes will be stabilized by more dependable agricultural production. Project installation will create seven full-time jobs and 10 seasonal on-farm jobs. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.

[a] Includes $62,700 for reservoir costs that could be assigned to a joint-use reservoir at the same site or another site in the same area

AGRICULTURE (Irrigation) **Badger Basin Unit—USBR** The project will supply 1,600 acres of irrigable land with water pumped from Clarks Fork. Structures necessary will be a pumping plant and two laterals. Lateral No. 1 will supply 1,020 acres and lateral No. 2 will supply 580 acres.	First Cost $1,968,000 Total Annual Cost $133,700[a] Annual Benefits $162,000[b]	The project will create some aquatic furbearing animal habitat in canal laterals, and create some goose and duck nesting areas. Waste grains will provide waterfowl food. There will be some sage grouse and antelope habitat loss. Silt will be removed from some streams. The average annual streamflow will be slightly reduced and there will be a small increase in salinity of return flows. The project will create the visual effects of canals, laterals, diversion dams, pumping plants, and access roads in an area now barren. Streamflows will be depleted by about 2,400 acre-feet per year.	In addition to the NED benefits, the project will generate $317,600 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	Farm income will increase and stabilize through implementation of the irrigation project. General income levels of the surrounding area will increase from the construction funds. After construction operation and maintenance will provide continued additional income to the area. Outmigration of young people will be reduced by increased agricultural employment opportunities. During construction demands on items such as housing, streets, waste facilities, schools, and health services could cause an economic and emotional stress on area residents.
Clarks Fork Basin Off-stream storage Irrigation—USBR A 6,500 acre-foot water storage reservoir will provide a supplemental water supply of 1,920 acre-feet per year to the Badger Basin Unit and an additional 3,820 acre-feet to the Cyclone Bar Project for irrigation purposes.	First Cost $1,353,300 Total Annual Cost $91,450 Annual Benefits for Off-stream Project Badger Basin $30,600 Cyclone Bar $62,700 (irrigation) $93,300	The project will create a reservoir with a surface area of 320 acres and will create some goose and duck resting areas. Waste grains will provide waterfowl food. There will be some sage grouse and antelope habitat loss. The average annual streamflow will be slightly reduced and the land will be committed essentially forever. The project will create the visual effects of canals, diversion dams, and reservoirs.	In addition to the NED benefits, the project will generate $30,935 in regional benefits as a result of increased employment income and $93,300 as a result of induced business in the region and other secondary effects.	Farm income will increase and stabilize through implementation of the irrigation project. General income levels of the surrounding area will increase from the construction funds. After construction, operation and maintenance will provide continued additional income to the area. Outmigration of young people will be reduced by increased agricultural employment opportunities. During construction population of the area will increase and demands on items such as housing, streets, waste facilities, schools, and health services could cause an economic and emotional stress on area residents

[a] Includes $29,600 for allotted share of storage cost at off-stream Clarks Fork Site 1B

[b] Includes $35,800 benefits assignable to storage

TABLE 42, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE REGIONAL DEVELOPMENT	SOCIAL WELL BEING
Clarks Fork River Component 1—The Wyoming border down to Crandall Creek Bridge is designated as 20 miles of recreational river—FS Proposed national designation as a recreational river with one major access site and one minor access area, and acquire scenic easements on 440 acres	First Cost $524,000 Annual Equiv Cost $73,200 Annual Benefits $108,800	A higher level of recreation use is offset by the protection of resources. Present or future endangered or threatened wildlife or vegetative species will be identified and protected and excellent water quality will be maintained. Development will result in some loss of options for future uses, but will not involve irreversible or irretrievable effects. The natural beauty along this stretch of the river will be maintained.	In addition to the NED benefits the project will generate about $55,000 in regional benefits as a result of increased employment income and about $100 000 as a result of induced and stemming from benefits from component 1 corresponding figures for component 2 will be about $45,000 and $95,000	Recreation facilities in the Yellowstone Park area are becoming overcrowded. The protection of this scenic area and the expansion of its use will improve the quality of the recreational experience in other areas that will otherwise be overcrowded. The operation and maintenance of the new facilities will provide at least two full-time and two part-time jobs. Tourists using the area and its facilities will improve business opportunities in the service area.
Component 2—From the Crandall Creek bridge to the mouth of the canyon is 22 miles. Proposed national designation as a wild and scenic river with two major access sites and one minor access area no land acquisition is required	First Cost $372,000 Annual Equiv Cost $65,600 Annual Benefits $93,100			
LAND CONSERVATION		*BASINWIDE*		
Accelerated Land Conservation A State and Private Lands 1,432,000 Acres	A. Cap. Cost $25,915,000 *Ann Equiv Cost $2,100,200	Additional reduction of soil loss and sediment yield	Maintain and enhance the output of goods and services to users in the region.	Downstream water quality would be improved for all uses.
B National Resource Lands 556,000 Acres	B Cap. Cost $6,600,000 *Ann. Equiv Cost $534,900	Increased vegetative cover resulting from improved management of existing resources	Provide additional employment in the application and maintenance of proposed measures.	General esthetics of the land would also be improved
C. Forest Service Lands 5,540 Acres	C. Cap. Cost $3,959,000 *Ann. Equiv. Cost $320,800 Annual Benefits—not computed—assumed to be at least equal to costs. *6⅜ percent interest for 25 years.	Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams. Late season streamflows will be increased through the reduction of overland surface flows, increased soil infiltration, and moisture-holding capabilities.	Provide additional permanent employment in processing increased goods and services	

TABLE 43
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, NORTHEAST WYOMING

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
MULTIPURPOSE				
South Tongue-Prairie Dog Project Irrigation, recreation, fish and wildlife, and industrial water supply a/ A 27,300 acre-foot reservoir at the South Fork Site was created by a dam about 50 feet high and 1,000 feet long, a 2-mile long conduit in Tongue River Canyon, a canal to provide 9,200 acres with supplemental water, and releases to the stream for instream flow use and downstream diversion for industrial use. Firm water yield of the system would be 27,600 acre-feet per year—5,700 for irrigation and 11,900 for other uses.	Total Cost$24,497,000 Total Annual Cost $1,238,000 Annual Benefits Irrigation $357,000 Industrial $3,867,000b/	*TONGUE RIVER SUBBASIN* There will be a loss of about 2.5 miles of excellent stream fishery (class 2) replaced by a reservoir fishery. The reservoir will inundate some important wildlife habitat and summer grazing area for livestock. U.S. Hwy 14 will be relocated to provide scenic views of the dam and reservoir. A view of the existing natural stream along the highway will be inundated. Diversion and aqueduct in the Tongue River Valley and drawdown of the reservoir resulting in mud flats may be esthetically undesirable.	In addition to the NED benefits, the project will generate $371,400 in employment benefits and $3,000,000⅛- in induced and stemming from benefits; additional facilities will be regulated to handle population increases.	About 3 miles of U.S. Hwy. 14, privately owned campgrounds and a group camp, and a number of summer homes will be inundated. All of these facilities could be relocated along the reservoir but the setting could be changed from a natural stream area to a flat-water area. A readily accessible area for small boats, water skiing, flat-water fishing, snowmobiling, and other uses will be made available to the public.

a/ Prairie Dog Reservoir will be built by private industry as a part of this development. Total firm water needs for industry are 30,000 acre-feet per year including the 11,900 to be provided by the South Fork Reservoir. The total cost of the joint development will be about $42 million, annual costs will be about $2.1 million, and annual benefits will be about $10.1 million.

b/ At $325 per acre-foot, alternative cost-benefits for fish and wildlife, recreation, and instream flow are not available.

TABLE 43, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, NORTHEAST WYOMING

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Northeast Wyoming Water Project—Wyoming A coordinated water supply system for agriculture, industry, recreation, fish and wildlife, and other functions. The project will be developed in three stages to keep the investment and adverse effects to a minimum commensurate with needs. The first stage will involve development of a deep well field near Moorcroft to obtain water from the Madison formation and a pipeline from the field to the regulating reservoir near Gillette. Water will be delivered to users at the reservoir site. The second stage will involve a pumping plant on lower Clear Creek as well as a pipeline and pumps to move water to the regulatory reservoir. The third stage will involve construction of a 250,000 acre-foot reservoir on lower Clear Creek to firm up supplies for the Clear Creek-Rawhide pipeline and regulating reservoir	First Cost: Stage One $31,745,000 Stage Two $42,852,000 Stage Three $88,415,000 Total $163,012,000 Annual Costs: Stage One $3,060,000 Stage Two $3,937,000 Stage Three $9,514,000 Total $16,514,000 Benefits: Stage One $4,475,000 Stage Two $5,000,000 Stage Three $10,287,000 Total $19,762,000	This project will eliminate the need for separate industrial and agricultural water storages, related pipeline, and other facilities at sites on the Powder and Crazy Woman Creeks. Instream flows will be enhanced on the Powder Creek, Clear Creek, and possibly on the Little Powder and other tributaries depending upon where return flows are ultimately channeled. A single pipeline will serve the same purposes as several that might otherwise be developed. About 3 miles of poor-quality fishing stream will be replaced by a reservoir fishery. A reservoir fishery and recreational water body will be provided near Gillette on a stream that has little or no recreational or fishery value now. Wildlife habitat in the reservoir areas will be destroyed	Employment and induced benefits in the area will amount to some $5 million during the construction period and about $2.5 million annually during the operating period	The quality of water available to Gillette and other communities in the area will be significantly improved. The average income in the area will increase as a result of the developments the project will create
AGRICULTURE (Irrigation) **Kaycee Project** Irrigation, M&I Water—Wyoming The project will involve State acquisition of the Carter-Arco Energy Company interests in the Middle-Fork reservoir to provide supplemental water supplies as agreed to under the existing Carter-irrigation district contract, plus water for	($1,000) Investment $26,500,000 Annual Cost $2,227,000 Annual Benefits $2,377,000	About 1,000 acres of rangeland will be converted to water storage use, and 5,000 acres of rangeland will be converted to irrigated agriculture with the accompanying change in wildlife habitat. Floods will be controlled by a surcharge in the reservoir. Streamflows below the reservoir will be stabilized.	In addition to the NED benefits, employment and induced and stemming from benefits amounting to $1,375,000 annually will accrue to the area.	About 30 new family-sized irrigated farms will be made available in the area. Income to existing farmers will be increased, and trade in the communities serving the area will be enhanced. Some additional part-time employment will be required on the farms and additional service employment will be created in the service area

4,700 additional irrigated acres, and supplemental water for additional presently irrigated land in the area Water could also be supplied to towns south and east of Powder River. The industrial water for Carter-Arco will be replaced from the proposed Northeast Wyoming Water Project.				
Ucross Unit Irrigation Irrigation in the Ucross Unit currently totals 7,480 acres. Irrigable lands under existing facilities total 1,450 acres. There are 1,970 acres for new irrigation under private development and 1,330 acres for new irrigation by the Bureau of Reclamation. Storage requirements could be met by the purchase or exchange of water in Lake DeSmet.	First Cost $7,819,350 Total Annual Cost $499,500 Annual Benefits $512,900	Some duck and goose nesting areas will be created and waste grains will provide waterfowl food Water quality will be improved due to silt being removed from some streams. Some wildlife habitat will be changed The project will create a visual effect of canals, laterals, diversion dams, pumping plants, access roads, and recreational facilities. Hunting will be lost on some project lands. The loss of secluded areas will affect big game animals. Some sage grouse habitat will be lost. The area cannot be returned to its former condition after the economic life of the project is complete.	In addition to the NED benefits, the project will generate $944,400 as a result of increased employment income, induced business in the region, and other secondary effects; offsetting costs will be incurred.	Construction and operation of the proposed project will create both temporary construction jobs and permanent on-farm work, thus, helping to reverse the recent historical trend of outmigration of young people from the agricultural community Stabilization of income will result to farmers and service-related industries. Employment of semiskilled labor will increase through establishment of farm units A dependable water supply will help insure a consistent flow of farm commodities in the area Local service facilities such as waste treatment plants, schools, and law enforcement capabilities may have to be upgraded
RECREATION **Tongue River Recreation** Component 1—Source to National Forest Boundary Scenic or Recreation River—FS Proposed national designation as a scenic or recreational river with one major access site and one boater access area No land acquisition is necessary since this component flows entirely within Federal lands.	First Cost $216,000 Annual Equiv. Cost $59,700 Annaul Benefits $67,600	The scenic beauty along 26 miles of the nationally designated scenic and recreational river will be preserved as a free-flowing stream. A higher level of recreation is offset by the protection of resources; interpretation will enhance public use value; present or future endangered or threatened species of wildlife or vegetation will be identified and protected, water quality will be improved due to increased and improved sanitary facilities; State standards will be met; scenic, recreational, and wildlife options will be maintained; and scenic and recreational values will be preserved and enhanced; and future development choices will be lost.	In addition to the NED benefits, the project will generate $55,392 in employment benefits and $67,600 as a result of induced business in the region and other secondary effects.	The river and its environment offer visitors and local residents recreational opportunities such as fishing, hunting, camping, picnicking, sightseeing, canoeing, rafting, nature study, and other water-related activities The pleasures associated with river-oriented recreation are important to social well-being Recreational opportunities along pleasant streams renew human vitality, operation and maintenance of facilities provide additional full-time jobs, and local business establishments profit from increased tourist trade

TABLE 43, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, NORTHEAST WYOMING

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ACCOUNT: ENVIRONMENTAL QUALITY	ACCOUNT: STATE-REGIONAL DEVELOPMENT	ACCOUNT: SOCIAL WELL-BEING
FLOOD CONTROL **Sheridan Flood Control (Stage III)** Flood Control—COE The project involves the construction of 2.4 miles of intermittent levees and channel improvements along Goose Creek, upstream of stage I.	First Cost $894,000 Total Annual Cost $61,000 Identified Benefits $61,000 (Value of protecting stages I and II, developments have not been evaluated.)	The human environment will be improved through weed reduction, better drainage, and mosquito control. Fourteen acres of clearing and grubbing may reduce some wildlife habitat	**Beneficial Effects** $69,000 regional growth annually resulting from flood protection. $89,000 added business created by construction activity **Adverse Effects** $61,000 total annual cost, 31 acres lost to land base, $7,700 average annual residual damages.	Protects 200 acres of urban land and improvements from flooding, enhances the health and social well-being of 10,000 residents, and encourages more orderly development in protected areas
MULTIPURPOSE **Cabin Creek Project** Irrigation and flood control—SCS A multipurpose dam will control flood damage and provide water storage for irrigation of about 330 acres.	First Cost $397,240 Total Annual Cost $26,450 Annual Benefits $26,480	*CHEYENNE RIVER BASIN* About 200 acres of rangeland will be committed to reservoir use and about 150 acres of rangeland will be subject to periodic inundation. Suspended sediment will be decreased in Cabin Creek and in a short reach of the Belle Fourche River.	In addition to the NED benefits, the project will generate $28,260 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects	The net ranch income will be increased by about $15,000 annually and community income will be increased by nearly $55,000 annually because of increased employment and business generated by the project Ranch and community income will be stabilized by more dependable agricultural production Project installation will enable more efficient utilization of underemployed labor resources committed to the project area ranches. The project will generate one full-time job and provide additional part-time employment in the agribusiness industry. The threat of flooding will be reduced to area ranches.

Middle Fork Crazy Woman Project Irrigation, water storage, recreation, and flood control—SCS A multipurpose reservoir will provide supplemental water to 3,000 acres of existing irrigated lands. This development is contingent to providing energy-related water needs to Sunoco from the Northeast Wyoming Water Project or some other source.	First Cost $2,180,000 Total Annual Cost $169,000 Annual Benefits $286,000	*POWDER RIVER BASIN* The reservoir will cover about 1 mile of live stream, and about 400 acres of mountain grazing will be committed to water storage use. About 150 acres of barren ground will be exposed by the annual drawdown of the reservoir, and about 265 acres of flat water can be made available for fishing and recreational use.	In addition to the NED benefits, the project will generate $331,000 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	The net ranch income will be increased by about $30,000 annually and community income will be increased by $600,000 annually. Ranch and community income will be stabilized by more dependable agricultural production. Project installation will create six full-time jobs and six seasonal on-farm jobs. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region. Recreational opportunities of region residents will be enhanced through the formation of a permanent pool of 265 acres.
LAND CONSERVATION **Accelerated Land Conservation** A. State and Private Lands 5,472,000 Acres B National Resource Lands 217,000 Acres C. Forest Service Lands 110,100 Acres	A. Cap. Cost $32,427,000 *Ann. Equiv. Cost $2,627,900 B. Cap. Cost $2,562,000 *Ann. Equiv. Cost $207,600 C. Cap. Cost $2,009,000 *Ann. Equiv. Cost $162,800 Annual Benefits—not computed—assumed to be at least equal to costs *6⅜ percent interest for 25 years.	*BASINWIDE* Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover resulting from improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams. Late season streamflows will be maintained through reduction of overland surface flows, increased soil infiltration, and moisture-holding capabilities.	Maintain and enhance the output of goods and services to users in the region. Provide additional employment in the application and maintenance of proposed measures. Provide additional permanent employment in processing increased goods and services.	Improved downstream water quality for all uses. Improve general esthetics of the land

TABLE 43, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, NORTHEAST WYOMING

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
ENERGY DEVELOPMENT				
Coal Production and Conversion a/ Involves production of 103.47 million tons of coal per year by 1985 and 203.47 million tons by 2000. About 890 megawatts of electric generating capacity will be available in 1985 and 2,390 megawatts will be on line by 2000. Four slurry lines will be required in addition to extensive railroad improvements to move coal from mines to use areas outside the area	Investment b/ $1,692,000,000 Annual Cost $619,333,000 Annual Benefits $728,506,000	About 5,873 tons of particulates, 23,172 tons of sulfur oxides, and 19,303 tons of nitrous oxides will be discharged to the atmosphere by 1985. By 2000, the relative figures will be 6,454, 17,467, and 64,554. About 4,000 acres of land will be used for energy developments in 1985 and 8,500 in 2000. Water consumption will amount to 37,000 acre-feet and 102,500 acre-feet for 1985 and 2000, respectively. Over 50 coal trains, each over a mile long, will leave and return to the area each day by the year 2000. A new high voltage transmission line will cross at least a part of the area	Tax and other revenues from coal production will amount to about $16 million annually by 1985 and $35 million by 2000. The tax base for the area will increase by more than $1 billion, not including the value of residential and commercial facilities that will result from the development. Public facilities such as schools, libraries, medical institutions, water and sewage plants, etc. will be required	More people will mean more problems. Average incomes will increase with respect to other areas and in the long run services will significantly improve but in the short run services will probably deteriorate as the area struggles to keep up with growing social well-being loads. Social structures will change from predominantly rural orientations to predominantly urban. Recreational opportunities will be limited or values may be reduced as a result of increased loads

a/ Harza's Extensive Development without gasification, adjusted to reflect air cooling at Wyodak powerplant, and addition of 2,000 megawatts of generation in area 6, using Montana coal

b/ All figures are exclusive of transportation

NOTE: The "without" condition summarized in chapter 4 includes gasification on the assumption that industry or government will subsidize the early stages of development of the gasification industry. Since gasification production revenues are not expected to exceed production costs before the year 2000, gasification does not meet the established criteria for NED projects, and gasification has not been included in the NED plan. This plan also presumes that Montana's law which in effect prohibits the use of water for slurry will remain in effect. Under this concept, additional slurry lines from Wyoming permit hauling more Montana coal over rail links that would otherwise carry Wyoming coal

Table 44
NEO ENERGY DEVELOPMENT RESOURCE REQUIREMENTS AND AIR POLLUTION EMISSIONS

Development	Units	Tongue-Powder Montana		Lower Yellowstone Montana		North Dakota		Northeast Wyoming		Study Area Total	
		1985	2000	1985	2000	1985	2000	1985	2000	1985	2000
Coal Production	Million tons/year	57	203	85	176	20.71	164.88	103.47	203 47	266.18	747.35
Exports	Total million tons/year	57	203	76	167	0.31	136.54	101.33	196.64	234 64	703.18
Rail	Million tons/year	28	89	46	105	0.31	1.96	50.33	94.64	124 64	290.60
Slurry	Million tons/year	29	114	30	62		134.58	51	102	110	412.58
Conversion											
Thermal Electric	Million tons/year	0	0	9	9	20.4	28.34	2.14	6.83	31.54	44.17
Capacity	Megawatts	0	0	2,350	2,350	8,046	8,873	890	2,390	11,286	13,613
Generation	Gigawatts	0	0	14,405	14,405	28,333	40,806	3,860	12,913	46,598	68,124
Syngas	Million tons/year	0	0	0	0	0	0	0	0	0	0
Capacity (Hi-BTU)	Million cubic feet/day	0	0	0	0	0	0	0	0	0	0
Water Requirements	Total acre feet	18,540	72,460	59,710	85,826	74,331	210,628	44,401	102,520	196,982	471,434
Mines	Acre feet/year	1,140	4,060	1,700	3,520	414	3,298	2,069	4,069	5,323	14,947
Reclamation	Acre feet/year	—	—	4,760	9,856	3,085	24,568	3,111	5,911	—	—
Coal Gasification	Acre feet/year	0	0	0	0	0	0	0	0	0	0
Electrical Generation	Acre feet/year	0	0	35,250	35,250	70,832	102,015	8,783	31,284	114,865	168,549
Slurry Lines	Acre feet/year	17,400	68,400	18,000	37,200	0	80,748	30,438	61,256	65,838	247,604
Labor Requirements											
Operating											
Mines	Man years/year	1,168.5	4,161.5	1,742.5	3,608	421	3,904	1,920	3,770	5,252	15,443.5
Electrical Generation	Man years/year	0	0	305	305	1,046	1,153	116	313	1,467	1,771
Syngas	Man years/year	0	0	0	0	0	0	0	0	0	0
Capital											
Mines	Million dollars	324.9	1,157.1	484 5	1,003.2	84	1,263	515	1,032	1,408.4	4,455.3
Electrical Generation	Million dollars	0	0	306	308	2,241	2,508	165	660	2,712	3,476
Syngas	Million dollars	0	0	0	0	0	0	0	0	0	0
Land Requirements											
Strip Mines	Acres/year	820 4	2,923.2	1,225	2,634.4	793	5,314	798	1,516	3,635.4	12,287.6
Sites											
Mines	Acres	1,710	6,090	2,550	2,580	621	4,946	3,104	6,104	7,985	19,720
Electrical Generation	Acres	0	0	2,350	2,350	8,046	8,873	890	2,390	11,286	13,613
Syngas	Acres	0	0	0	0	0	0	0	0	0	0
Air Pollution Emissions											
Particulates	Tons/year	0	0	7,202	7,202	14,166	20,403	5,873	6,454	27,241	34,059
Sulfur Oxides	Tons/year	0	0	86,400	86,400	169,996	244,835	23,172	17,467	279,568	348,702
Nitrogen Oxides	Tons/year	0	0	72,000	72,000	141,663	204,029	19,303	64,554	232,966	340,583

The Environmental Quality Plan

The environmental quality plan is intended to include those developments or preservation efforts that either protect or enhance the environment where "environment" is defined as the total ecological, physiological, and sociological setting in which man lives. Under this broad definition, there are wide differences of opinion on what constitutes environmental quality. To the avid outdoorsman, it may mean maintaining a pristine, unpolluted atmosphere at the expense of physical comforts if necessary. To others particularly those who are older or handicapped, it may mean a comfortable home, an easy chair, and a television set, even if providing those comforts means some degradation of the outside conditions. There are all shades of differences between these extremes. Even if all needed information was in hand, developing an EQ plan under the consensus method of operation would be difficult.

For a myriad of reasons, all needed environmental data were not available, and, as a result, the environmental quality objective and the environmental quality account of other objectives have received relatively less adequate treatment than the national economic development objective. The following explains some of the reasons for this imbalance and recommends corrective actions for the future.

According to the principles and standards (P&S), "the environmental objective is enhanced by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and curtural resources and ecological systems in the area under study and elsewhere in the Nation."

The plan of study (POS) for the Yellowstone level B states on page 21, "This study will be of reconnaissance level. For projects, programs, or other elements to be included in the level B planning analysis they must contain, as a minimum, reconnaissance level cost and benefit information." On page 22, the POS goes on to say, "Background data to be used in the level B study will be taken or updated from available sources, such as reports on studies listed in the introduction of this POS, to the extent practicable. Major baseline studies will not be undertaken."

The POS's statements regarding use of existing studies and reports and the fact that no new baseline studies are to be accomplished are consistent with the time and, to a lesser extent, dollar constraints of the study. However, society has not until recently encouraged projects that were primarily environmental in nature. As a consequence, there were very few "environmental" projects that had been examined in any detail. Lack of an inventory of environmental projects argued for strong participation by those who deal most directly with environmental concerns. The latter did not happen like it should have. Seldom was an analysis of the past, present, and future provided as a basis for supporting proposals for EQ actions.

Conversely, many projects whose major purposes were national economic income, have been examined in detail in the past. These projects could be and were updated and proposed as NED plan elements by the agencies concerned.

The results of this set of circumstances is an EQ plan that is inadequate. The limited number of environmental projects does not mean that others are not possible, but only that the issues were not fully addressed. Environmental elements in the plan must be given the benefit of the doubt when account displays are examined for completeness and accuracy.

The beneficial and adverse effects of the EQ plan elements have been eveluated and are displayed for each of the seven planning areas in tables 45 through 51.

Table 52 shows the EQ energy resource requirements and air pollution emissions.

TABLE 45
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, UPPER YELLOWSTONE

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
FISH AND WILDLIFE Removal of fish-spawning barriers to tributary streams	Modification of culverts could cost about 2,000 apiece; however, if bridges became necessary the costs would be higher.	Removal of barriers will allow passage of salmonoids from the Yellowstone River to upstream spawning sites in the smaller tributaries.	Not Available	Not Available
Flow regimen improvement of tributary streams above Livingston	Not Available	Provision of more adequate instream flows will improve trout habitat in these tributaries.	Not Available	Costs to landowners may be incurred in instituting better water conservation and land use measures.
Antelope Creek storage	First Cost $9,606,000 Annual Benefits Not Available Annual Cost $621,700	Provision of adequate summer instream flows for fish and wildlife.	Not Available	Benefits will accrue to locality from employment and other short-term secondary benefits. The reservoir will also provide some recreational benefits to individuals.
Management of Yellowstone River islands to improve geese and wildlife habitat	Not Available	Proper management will increase the geese population in the basin; other types of wildlife utilizing the islands will also benefit.		Benefits will accrue from additional recreational benefits stemming from increased hunting opportunities.
Wheat Basin and Broadview wildlife refuges	Not Available	Provision of a constant water supply for existing wildlife refuge while allowing for development of new refuges.	Not Available	Not Available
Sweet Grass Creek storage	First Cost $4,104,000 Annual Benefits Unknown Annual Costs $334,500	Provision of adequate summer instream flows for fish and wildlife.	User Benefits Unknown Regional Benefits $101,200 Net Benefits Unknown	Minor population stabilization increase seasonal jobs, economic stability, and construction employment.
Instream flows compare the reservation requests of the Departments of Fish and Game and Health and Environmental Sciences. Take the highest flow in each case.	Precludes increased municipal water treatment costs and costs to irrigator due to loss of quality	Preservation of existing fish and wildlife habitat and water quality prevents any further degradation	Same as NED	Minor population impact on town of Big Timber during two construction seasons could be handled by motels and trailer parks.

TABLE 45, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, UPPER YELLOWSTONE

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Greenbelt Program	No new full-service irrigation	The program will add to fish and wildlife habitat while helping to prevent streambank erosion	Not Available	Potential negative effects on agricultural employment and expansion possibly limits industrial and domestic future uses of river water—again limiting income and employment
Rehabilitation of the Headwater Basin of the Shields River	Not Available	Rehabilitation of the area will alleviate the severe sedimentation problems that now exist in the area. Water quality and fresh water salmonoid habitat will be improved.	Not Available	Not Available
RECREATION				
Classify the Beartooth and Absaroka Primitive Areas as a wilderness area.	Not Available	Maintain a unique natural area in its natural state	Not Available	Not Available
Yellowstone River				
Establish national wild and scenic river designation for the Yellowstone River from Gardiner to Pompeys Pillar for 225 miles.	First Cost $38,547,000 Annual Benefits $2,832,500 Annual Cost $3,323,700	The natural beauty along these reaches of streams will be preserved for present and future generations and water quality will be improved. Flora and fauna habitat values will be protected and a higher level of recreational use will be offset by better protection of the resource.	Tourism is a major contributor to the area and State economies. Recreational benefits resulting from preservation of these river reaches is in the State-regional interest. Other analysis is not available.	The pleasures associated with river-oriented recreation are important to social well-being. Local residents as well as tourists relax and revitalize themselves through their association with the pleasures provided by nature
Boulder River				
Establish State recreational river designation for the Boulder River from Upside-Down Creek to confluence with the Yellowstone River for 58 miles	First Cost $4,130,000 Annual Benefits $283,500 Annual Cost $385,800	Same as above	Same as above	Same as above

Shields River Establish State recreational river designation for the Shields River from Flathead Creek to confluence with the Yellowstone River for 40 miles	First Cost $6,568,000 Annual Benefits $195,500 Annual Cost $507,000	Same as above	Same as above	Same as above
Stillwater River Establish State recreational river designation for the Stillwater River from 20 miles above the U.S Forest Service Woodbine Campground to confluence with the Yellowstone River for 65 miles	First Cost $4,964,000 Annual Benefits $317,700 Annual Cost $454,500	Same as above	Same as above	Same as above
LAND CONSERVATION Accelerated Land Conservation A. State and Private Lands 431,000 Acres B National Resource Lands 13,500 Acres C Forest Service Lands 2,400 Acres	A Cap. Cost $18,304,000 *Ann. Equiv. Cost $1,483,400 B. Cap. Cost $167,000 *Ann. Equiv. Cost $13,500 C. Cap. Cost $991,000 *Ann. Equiv. Cost $80,300 Annual Benefits—not computed—assumed to be at least equal to costs. *6 3/8 percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover resulting from improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams.	Maintain and enhance the output of goods and services to users in the region. Provide additional permanent employment in processing increased goods and services.	Improved downstream water quality for all uses. Improve general esthetics of the land. Ensures that resources are available for use in the future

TABLE 46
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, CLARKS FORK-BIGHORN

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
FISH AND WILDLIFE				
Instream flows are the same as the reservation request of the Department of Fish and Game	Maintaining the recommended instream flows would tend to maintain water quality at its present level by preserving flows for the assimilation and dilution of wastes, thereby preventing increased water treatment costs to municipalities. These flows will stimulate river-based recreation and maintain quality water for existing irrigators. If implemented, these flows will have an adverse impact on additional irrigation projects.	Preservation of existing fish and wildlife habitat and water quality prevents any further degradation.	Same as NED	Potential negative effects on agricultural employment possibly limits industrial and domestic future uses of river water again limiting income and employment
Greenbelt Program	Not Available	The program will add to fish and wildlife habitat while helping to prevent streambank erosion.	Not Available	Not Available
RECREATION				
Classify the Beartooth and Absaroka Primitive Areas as a wilderness area	Not Available	Maintain a unique natural area in its natural state.	Not Available	Not Available
Bighorn River Establish State recreational river designation for the Bighorn River below Bighorn National Recreation Area to Yellowstone River for 50 miles	First Cost $8,044,000 Annual Benefits $525,000 Annual Cost $698,700	The natural beauty along these reaches of streams will be preserved for present and future generations and water quality will be improved. Flora and fauna habitat values will be protected and a higher level of recreational use will be offset by better protection of the resource.	Tourism is a major contributor to the area and State economies. Recreational benefits resulting from preservation of these river reaches is in the State-regional interest. Other analysis is not available.	The pleasures associated with river-oriented recreation are important to social well-being. Local residents as well as tourists relax and revitalize themselves through their association with the pleasures provided by nature.

Clarks Fork River Establish State recreational river designation for the Clarks Fork-Montana-Wyoming border to Yellowstone River for 75 miles; the Clarks Fork source to the Montana-Wyoming border will be administratively managed by the U.S. Forest Service for 10 miles.	First Cost $11,946,000 Annual Benefits $307,100 Annual Cost $943,300			
LAND CONSERVATION Accelerated Land Conservation A. State and Private Lands 385,000 Acres B. National Resource Lands 25,500 Acres C. Forest Service Lands 0 Acres	A. Cap. Cost $9,296,000 *Ann. Equiv. Cost $753,300 B. Cap. Cost $303,000 *Ann. Equiv. Cost $24,600 C. Cap. Cost 0 *Ann Equiv. Cost 0 Annual Benefits—not computed—assumed to be at least equal to costs. *6⅜ percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover resulting from improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams.	Maintain and enhance the output of goods and services to users in the region. Provide additional employment in the application and maintenance of proposed measures. Provide additional permanent employment in processing increased goods and services.	Improved downstream water quality for all uses. Improve general esthetics of the land.

TABLE 47
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, TONGUE-POWDER

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
FISH AND WILDLIFE				
Instream flows are the same as the reservation request of the Department of Fish and Game	Existing irrigators will benefit from the maintenance of water quality levels and existing diversions There is little water available for consumptive use over and above the instream needs in the months of July, August, and September in low-flow periods. That occurs only one year in ten on the average and there is no surplus water in any month. Even if these flows were implemented, while industrial users could probably afford the necessary reservoir, irrigators probably could not	Preservation of existing fish and wildlife habitat and water quality prevents any further degradation	Same as NED	Potential negative effects on agricultural employment and income
Greenbelt Program	Not Available	The program will add to fish and wildlife habitat while helping to prevent streambank erosion	Not Available	Not Available
RECREATION				
Tongue River Establish State recreational river designation for the Tongue River Reservoir to Yellowstone River for 115 miles	First Cost $18,398,000 Annual Benefits $586,500 Annual Cost $1,419,400	The natural beauty along these reaches of streams will be preserved for present and future generations and water quality will be improved. Flora and fauna habitat values will be protected and a higher level of recreational use will be offset by better protection of the resources.	Tourism is a major contributor to the area and State economies. Recreational benefits resulting from preservation of these river reaches is in the State-regional interest. Other analysis is not available	The pleasures associated with river-oriented recreation are important to social well-being. Local residents as well as tourists relax and revitalize themselves through their association with the pleasures provided by nature.

ENERGY *EQ Energy Development*	Private Capital Cost $91,200,000 Annual Benefits $104,390,000 Annual Cost $88,770,000	Coal production is held at 16 million tons per year, it is all exported by rail. Only a total of 1,216 acre-feet of water is consumed. Strip-mined land will total only 480 acres by the year 2000, it is still three times the production that is currently taking place.	Regional benefits are not available and it may be assumed that net benefits will increase substantially	Social impacts will be greatly lessened No thermal electric coal gasification or coal slurry lines are present Population growth is much slower under this scenario.
LAND CONSERVATION Accelerated Land Conservation A State and Private Lands 639,000 Acres B. National Resource Lands 78,000 Acres C. Forest Service Lands 4,300 Acres	A. Cap. Cost $7,653,000 *Ann. Equiv. Cost $620,200 B Cap. Cost $982,000 *Ann Equiv. Cost $79,600 C. Cap. Cost $1,119,000 *Ann. Equiv. Cost $90,700 Annual Benefits—not computed—assumed to be at least equal to costs. *6 3/8 percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover results from improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams.	Maintain and enhance the output of goods and services to users in the region. Provide additional employment in the application and maintenance of proposed measures Provide additional permanent employment in processing increased goods and services	Improved downstream water quality for all uses Improve general esthetics of the land.

TABLE 48
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, LOWER YELLOWSTONE

PLAN ELEMENT	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
FISH AND WILDLIFE				
Instream flows compare the reservation requests of the Departments of Fish and Game and Health and Environmental Sciences. Take the highest flow in each case	Precludes increased municipal water treatment costs and costs to irrigator due to loss of quality. If implemented, these flows will have an adverse impact on additional irrigation projects.	Preservation of existing fish and wildlife habitat and water quality prevents any further degradation	Same as NED	Potential negative effects on agricultural employment and expansion possibly limits industrial and domestic future uses of river water, again limiting income and employment
Greenbelt Program	Positive benefits will come from the prevention of streambank erosion.	The program will add to fish and wildlife habitat while helping to prevent streambank erosion	Same as NED	Not Available
RECREATION				
Yellowstone River Establish national, scenic, and recreational designation for the Lower Yellowstone River from Pompeys Pillar to the Montana-North Dakota border for 260 miles.	First Cost $41,068,000 Annual Benefits $4,056,000 Annual Cost $3,636,200	The natural beauty along these reaches of streams will be preserved for present and future generation; water quality will be improved; flora and fauna habitat values will be protected, and a higher level of recreational use will be offset by better protection of the resources.	Tourism is a major contributor to the area and State economies. Recreational benefits resulting from preservation of these river reaches are in the State-regional interest. Other analysis is not available	The pleasure associated with river-oriented recreation is important to social well-being. Local residents as well as tourists relax and revitalize themselves through their association with the pleasures provided by nature

ENERGY				
EQ Energy Development	Private Capital Cost $336,300,000 Annual Benefits $382,330,000 Annual Cost $325,000,000	No additional thermal electric generation takes place above existing levels. Coal production is held at 59 million tons per year and all of it is exported by rail except that used to fire existing thermal electric plants. Water consumption is held to roughly 20,700 acre-feet per year. There are no slurry operations, and future production is still six times the current production. There will be no increase in air pollution emissions over present levels.	Regional benefits are not available; it may be assumed that net benefits will increase substantially	Population and social impacts will still be felt under the EQ plan; however, there will be less than one-half of the NED impacts
LAND CONSERVATION				
Accelerated Land Conservation A. State and Private Lands 1,551,000 Acres B. National Resource Lands 251,500 Acres C. Forest Service Lands 700 Acres	A. Cap. Cost $33,728,000 *Ann. Equiv. Cost $2,733,300 B. Cap. Cost $2,855,000 *Ann. Equiv. Cost $231,400 C. Cap. Cost $87,000 *Ann. Equiv. Cost $7,100 Annual Benefits—not computed—assumed to be at least equal to costs. *6⅜ percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover results from the improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams.	Maintain and enhance the output of goods and services to users in the region. Provide additional employment in the application and maintenance of proposed measures Provide additional permanent employment in processing increasing goods and services.	Improved downstream water quality for all uses Improve general esthetics of the land

TABLE 49

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, NORTH DAKOTA TRIBUTARIES

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
STREAMBANK EROSION				
Knife River Historical Site Protection - COE	First Cost $105,000 Annual Benefits $0 Annual Cost $6,973	Preserve an irreplaceable archaeological resource and restore the natural setting of the period of historic importance	Total Benefits 0 Total Adverse Effects -	Minor amount of increase in local employment during project construction
ENERGY DEVELOPMENT				
EQ Energy Development Scenario *Coal production will be 19 million tons per year by 1985 and 2000*	First Cost $529,000,000 Annual Benefits $181,500,000 Annual Cost $154,420,000	Energy-related facilities impose long-term obtrusions to the visual quality of the area Strip mining will affect 728 acres per year by 2000. Areas surrounding and downwind of energy conversion plants will be subjected to low levels of aerial contaminants over a long period of time. The value of the reclaimed lands will be dependent on the level of success of the reclamation program Water requirements will total 41,568 acre-feet per year by the year 2000.	Total Benefits Not Available Total Adverse Effects Not Available	Not Available
RECREATION				
Yellowstone River (22 miles of free-flowing stream) State designation	First Cost $3,264,000 Annual Benefits $110,000 Annual Cost $263,400	Maintain scenic, recreational, and wildlife options by the preservation of 22 miles of free-flowing stream from the North Dakota-Montana State line to the Missouri River.	Not Available	Land ownership and control will be regulated by the purchase of 8 acres, fee title, and 4,480 acres of easement
Knife River (76 miles of free-flowing stream) State designation	First Cost $12,142,000 Annual Benefits $380,000 Annual Cost $964,300	Maintain scenic, recreational, and wildlife options by the preservation of 76 miles of free-flowing stream from Manning, N Dak , to the Missouri River	Not Available	Land ownership and control will be regulated by the purchase of 76 acres, fee title, and 16,720 acres of easement
Heart River (106 miles of free-flowing stream) State designation	First Cost $16,796,000 Annual Benefits $530,000 Annual Cost $1,613,100	Maintain scenic, recreational, and wildlife options by the preservation of 106 miles of free-flowing stream from Heart Butte Dam to the Missouri River	Not Available	Land ownership and control will be regulated by the purchase of 76 acres, fee title, and 23,320 acres of easement
Cannonball River (45 miles of free-flowing stream) State designation	First Cost $7,274,000 Annual Benefits $225,000 Annual Cost $577,400	Maintain scenic, recreational, and wildlife options by the preservation of 45 miles of free-flowing stream from the county road south of Shields, N Dak , to the North Dakota Bridge 1806.	Not Available	Land ownership and control will be regulated by the purchase of 68 acres, fee title, and 9,900 acres of easement
Missouri River (86 miles of free-flowing stream) national designation	First Cost $13,500,000 Annual Benefits $1,419,000 Annual Cost $1,251,800	Maintain scenic, recreational, and wildlife options by the preservation of 86 miles of free-flowing stream	Not Available	Land ownership and control will be regulated by the purchase of 16 acres, fee title, and 18,920 acres of

		from Garrison Dam to the mouth of the Heart River at Fort Lincoln State Park		easement.
PRESERVATION Unique Woodland Areas North Dakota	First Cost $129,240 Annual Benefits $8,250 Annual Cost $8,250	Provide protection and management of 4,328 acres of Ponderosa pine, 735 acres of limber pine, and 100 acres of columnar juniper and adjacent areas by administrative action on Federal lands and through acquisition of easements on private land. Provide protection of only natural Ponderosa pine in North Dakota	Total Benefits 0 Total Adverse Effects $8,250	Federal easement acquisition on 3,231 acres of private land for maintaining educational, cultural, and recreational values. Livestock cover preserved
INSTREAM FLOW Modified Level of Streamflow	Not Available	Provide a level of flow not below the following, provided natural conditions will permit: North Fork Grand River at Haley 8,536 acre-feet per year; Cannonball River at Breien 68,884 acre-feet per year; Little Missouri near Watford City 186,326 acre-feet per year; Knife River at Hazen 62,238 acre-feet per year, and Heart River near Mandan 70,628 acre-feet per year. These flows will provide for conservation of fish and wildlife.	Not Available	A restriction will be placed on water use for other purposes
LAND CONSERVATION Accelerated Land Conservation A State and Private Lands 1,787,000 Acres B National Resource Lands 14,000 Acres C. Forest Service Lands 5,500 Acres	A Cap. Cost $49,573,000 *Ann. Equiv Cost $4,017,400 B Cap Cost $140,000 *Ann Equiv Cost $11,300 C. Cap. Cost $1,198,000 *Ann Equiv. Cost $97,100 Annual Benefits—not computed—assumed to be at least equal to costs *6⅜ percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover results from the improved management of existing resources Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams	Maintain and enhance the output of goods and services to users in the region. Provide additional employment in the application and maintenance of proposed measures Provide additional permanent employment in processing increased goods and services	Improved downstream water quality for all uses Improve general esthetics of the land

TABLE 50
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
MULTIPURPOSE		*WIND RIVER BASIN*		
Sand Mesa Project Wildlife habitat and irrigation Two small reservoirs for wildlife habitat and 546 acres of sprinkler irrigation will provide wildlife feed crops or will be harvested as circumstances each year dictate.	First Cost $635,000 Annual Equiv Cost $44,200 Annual Benefits $58,000	Farming of the area could leave large areas exposed to wind erosion during the fall, winter, and spring. The SCS soils classification shows that the predominant soils of the area are prone to wind erosion Two small reservoirs will provide nesting habitat for Canadian geese that is expected to result in the annual production of about 250-300 goslings per year by 1982 The ponds will also provide resting areas for migrant waterfowl. The irrigated area will provide a more accessible feed supply for the waterfowl Unharvested crops and fringe areas will provide habitat necessary for increased production of pheasants, Hungarian partridge, and other upland game and songbirds.	In addition to the direct user (NED) benefits, the project will generate employment benefits of about $25,000 per year and induced and stemming from benefits of about $52,000, the regional cost-benefit ratio will be about 2 3 to 1	The increased irrigated acreage will increase the total agricultural returns to the area by about $40,000 annually Community income will increase by about $75,000 annually due to increased employment and business generated by the project installations and operations Project installation, operation and maintenance will provide increased full-time employment and increased agricultural output will create new seasonal on-farm jobs and generate additional full-time jobs in the agribusiness industry of the region The enhanced wildlife production will provide the base for increased employment in the service sectors dealing with tourism and hunting, therefore, increased wildlife population will provide increased opportunity for viewing wildlife as well as increase hunting Increased income will allow beneficiaries to more actively participate in social, cultural recreational, and community activities of the region.
RECREATION				
Popo Agie River Recreation Scenic and Recreational River—FS Component 1—North, Middle, and Little Popo Agie above the national forest boundary is 29 miles. Designate these streams as national, scenic, and recreational rivers under Forest Service management and add one minor access area.	First Cost $60,000 Annual Equiv. Cost $45,400 Annual Benefits $78,100a/	The scenic beauty along 29 miles of the designated scenic and recreational river will be preserved and managed by the U.S Forest Service as a free-flowing stream. A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value, present or future endangered or threatened species of wildlife and vegetation will be identified and protected; water quality will be improved due to increased and improved sanitary facilities; State	In addition to the NED benefits, the project will generate $35,000 in regional benefits as a result of increased employment benefits and $75,000 as a result of induced business in the area and other secondary effects.	The project with its new facilities will relieve pressure on existing facilities and provide for a better quality of recreational experience. Operation and maintenance of new facilities will create additional part-time jobs. Local business establishments will profit from increased tourist trade

NOTE: There is no agreement on what, if anything, should be done in component 2 and it has been dropped from consideration in this report. a/ Does not include fish and wildlife benefits.		standards will be met; scenic, recreational, and wildlife options will be maintained; scenic and recreational values will be preserved and enhanced; and future development choices will be lost.		
Wind River Recreation From source to Boysen Reservoir is a wild, scenic, or recreational river for 120 miles—HCRS National designation as a wild, scenic, or recreational river with three major access sites and two boater access areas for 120 miles is proposed.	First Cost $17,716,000 Annual Equiv Cost $1,386,700 Annual Benefits $666,000	A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value; present or future endangered or threatened species of wildlife or vegetation will be identified and protected; water quality will be improved due to increased and improved sanitary facilities; State standards will be met; scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced, and future development choices will be lost.	In addition to NED benefits, the project will generate $400,000 in employment benefits and $650,000 as a result of induced business in the region.	The project with its new facilities will relieve pressure on existing facilities and will improve the quality of the recreational experience. Operation and maintenance of new facilities will create additional full-time jobs. Local business establishments will profit from increased tourist trade
MULTIPURPOSE		*BIGHORN BASIN*		
Buffalo Bill Enlargement Environmental Protection Dikes—USBR Raising Buffalo Bill Dam 25 feet from its present height of 5,370 feet will increase the total surface area from 6,691 acres to 9,780 acres. In the upper reservoir, a dike system will be installed for dust abatement that will also have waterfowl enhancement areas. This plan element is dependent upon completion of the Buffalo Bill Enlargement proposed under the national economic development plan.	First Cost $11,884,000 Total Annual Cost $782,300 Annual Benefits—not evaluated except for $26,000 per year for waterfowl and game use of the dike areas. The major benefit will be air quality control. If the development was privately owned, the State and/or Federal air quality agencies would undoubtedly insist on the dikes as a condition to construction which suggests that the benefits of maintaining or providing air quality in the area would exceed its cost.	Water contained in ponds behind the earthen dike system will help prevent annual flooding, and will cover dust-producing lands and reduce air quality problems during winter months. Impoundment areas will provide waterfowl nesting areas and furbearing animal habitat and wildlife observation opportunities will be increased.	In addition to the NED benefits, the project will generate $611,000 in regional employment benefits and $134,000 as a result of regional induced and stemming from benefits.	Employment of construction workers will vary from 5 to 56 during the 2-year construction period. Most workers will be employed from local forces. Undesirable living conditions for local residents will be alleviated. The reservoir area will be more compatible with winter sports activities.

TABLE 50, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ACCOUNT: ENVIRONMENTAL QUALITY	ACCOUNT: STATE-REGIONAL DEVELOPMENT	ACCOUNT: SOCIAL WELL-BEING
RECREATION				
Bighorn River Recreation				
Component 1—From the Wind-Bighorn River-Boysen Dam to the north end of Wind River Canyon is 12 miles National designation as a wild, scenic, or recreational river and as a geologic educational site with one major access site and one minor access area is proposed The Wind River Canyon area is on the Wind Indian Reservation. This plan includes acquisition of land in fee title or easement to carry out the project.	First Cost $1,624,000 Annual Equiv Cost $134,800 Annual Benefits $94,100	The scenic beauty along 12 miles of the nationally designated recreational river will be preserved as a free-flowing stream A higher level of recreation will be offset by the protection of resources, interpretation will enhance public use value; present or future endangered or threatened species of wildlife or vegetation will be identified and protected, water quality will be improved due to increased and improved sanitary facilities; State standards will be met, scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced, and future development choices will be lost	In addition to the NED benefits, the project will generate $35,000 in employment benefits and $95,000 as a result of induced business in the region and other secondary effects	The project with its new facilities will relieve pressure on existing facilities and will provide for a better quality of recreational experience Operation and maintenance of new facilities will create additional full-time jobs Local business establishments will profit from increased tourist trade The project will provide access to the stream and fishing areas
Component 2—From the Bighorn River at the north end of the Wind River Canyon to Bighorn Lake is 98 miles Designation as a State scenic or recreational river[a] with three major access sites and two minor access areas is proposed.	First Cost $15,868,000 Annual Equiv. Cost $1,235,600 Annual Benefits $374,900[b]	The scenic beauty along 98 miles of the State designated recreational river will be preserved as a free-flowing stream. A higher level of recreation will be offset by the protection of resources, interpretaion will enhance public use value, present or future endangered or threatened species of wildlife or vegetation will be identified and protected, water quality will be improved due to increased and improved sanitary facilities; State standards will be met, scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced, and future development choices will be lost.	In addition to the NED benefits, the project will generate $500,000 in employment benefits and $375,000 as a result of induced business in the region and other secondary effects	South of the river there is a vast amount of recreational area with a limited number of recreational facilities. The project will give local residents the opportunity to fish, picnic, and have access to the stream Local business establishments will profit from increased tourist trade. The project will allow tourists to make use of the facilities and recreational opportunities and, therefore, relieve some of the pressure placed on facilities near or in Yellowstone Park
Classify the Cloud Peak Primitive Area as a wilderness area—HCRS	Annual Benefits—increased recreational use: $56,700	Wilderness designation affords protection to watershed, wildlife, conservation, and esthetic values	In addition to NED benefits, the project will generate $50,000 in regional benefits annually as a	"The richest values of wilderness lie not in the days of Daniel Boone, not even in the present, but rather

a/ See recommendation proposing authority for such deisgnation

b/ Does not include hunting and fishing benefits

		among others. It allows greater control of visitor use through permits, if necessary. These unique regions need this designation to afford the greatest degree of protection without easy declassification.	result of increased recreational expenditures.	in the future."—Aldo Leopold. All recreation areas will undoubtedly receive much heavier use in the future. It is important that they remain for this use—recreation—and not become developed for timber interests, vehicular uses, or water projects.
North Fork Shoshone River				
Recreation Component 1—From the north Absaroka wilderness boundary to the eastern national forest boundary is designated as a scenic and recreational river for 20 miles. Administrative designation as a U.S. Forest Service administered national recreational river with two major access sites and one minor access area is proposed. No land acquisition is necessary since this portion of the river flows entirely within Federal lands	First Cost $372,000 Annual Equiv. Cost $77,000 Annual Benefits $190,100	The scenic beauty along 26 miles of the designated scenic and recreational river will be preserved and managed by the U.S. Forest Service as a free-flowing stream. A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value, present or future endangered species of wildlife and vegetation will be identified and protected, water quality will be improved due to increased and improved sanitary facilities; State standards will be met; scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced, and future development choices will be lost.	In addition to the NED benefits, the project will generate $65,000 as a result of increased employment income and $200,000 as a result of induced business in the region and other secondary effects.	The river and its environment offer visitors recreational opportunities such as fishing, hunting, camping, picnicking, sightseeing, river floating, nature study, and other water-related activities. The pleasures associated with river-oriented recreation are important to social well-being. Recreation opportunities along pleasant streams renew human vitality. Many visitors bound for Yellowstone spend some time along the Shoshone River before entering the park. Local business establishments will profit from increased tourist trade.
Component 2—From the national forest boundary to the Buffalo Bill Reservoir is designated as a recreational river for 10 miles. Administrative designation as a State managed recreational river with one major access site and riverfront easements as necessary to maintain existing conditions is proposed	First Cost $1,756,000 Annual Equiv. Cost $136,500 Annual Benefits $60,800[a] a. Does not include hunting and fishing benefits	The scenic beauty along 10 miles of the designated recreational river will be preserved and managed by the State as a free-flowing stream. A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value; present or future endangered or threatened species of wildlife or vegetation will be identified and protected, water quality will be improved due to increased and improved sanitary facilities; State standards will be met; scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced; and future development choices will be lost	In addition to the NED benefits, the project will generate $30,000 in increased employment income and $60,000 as a result of induced business in the region and other secondary effects.	This portion of the river offers visitors numerous off- and on-river recreation opportunities. The pleasures associated with river-oriented recreation are important to social well-being. Recreation opportunities along pleasant streams renew human vitality. Many visitors bound for Yellowstone spend some time along the Shoshone River before entering the park. Local business establishments will profit from increased tourist trade

TABLE 50, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Porcupine Creek-Devil Canyon				
From source to the Montana border is designated as a scenic and recreational river for 22 miles. Administrative designation as a national, scenic, and recreational river with two minor access areas is proposed and a small reservoir may be developed.	First Cost $274,000 Annual Equiv. Cost $35,900 Annual Benefits $33,800	The scenic beauty along 22 miles of the designated scenic and recreational river will be preserved and managed by the U.S. Forest Service and the Bureau of Land Management as a free-flowing stream. A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value; present or future endangered or threatened species of wildlife or vegetation will be identified and protected, water quality will be improved due to increased and improved sanitary facilities; State standards will be met; scenic, recreational, and wildlife options will be maintained; scenic and recreational values will be preserved and enhanced; and future development choices will be lost.	In addition to the NED benefits, the project will generate $20,000 in regional benefits as a result of increased employment benefits and $35,000 as a result of induced business in the region and other secondary effects	The project will provide new facilities in an area where facilities are limited in number. The project will give local residents the opportunity to make use of the stream. Local business establishments will profit from increased tourist trade The project will allow tourists to make use of the facilities and recreational opportunities and, therefore, relieve some of the pressure placed on facilities near or in Yellowstone Park
Shell Creek Recreation				
From source to the Bighorn national forest boundary is designated as a scenic or recreational river for 26 miles. Administrative designation as a national, scenic, or recreational river with one minor access area is proposed. No land acquisition is necessary since this component flows entirely within Federal lands. This stream might be considered for national designation as a scenic or recreational river.	First Cost $60,000 Annual Equiv. Cost $38,400 Annual Benefits $65,400	The scenic beauty along 26 miles of the designated recreational river will be preserved and managed by the U.S. Forest Service as a free-flowing stream. A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value; present or future endangered or threatened species of wildlife or vegetation will be identified and protected; water quality will be improved due to increased and improved sanitary facilities; State standards will be met, scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced, and future development choices will be lost.	In addition to the NED benefits, the project will generate $45,000 in regional benefits as a result of increased employment income and $65,000 as a result of induced business in the region and other secondary effects.	The project will give local residents the opportunity to fish, picnic, and have access to the stream. Local business establishments will profit from increased tourist trade. The project is located on a major national highway and will induce tourists to make use of the facilities and recreational opportunities and, therefore, relieve some of the pressure placed on facilities near or in Yellowstone Park

Tensleep Creek From West Tensleep Lake to Tensleep, Wyo., is designated as a scenic and recreational river for 23 miles. Administrative designation as a national, scenic, and recreational river with two minor access areas is proposed	First Cost $1,202,000 Annual Equiv. Cost $113,500 Annual Benefits $79,800	The scenic beauty along 23 miles of the designated scenic and recreational river will be preserved and managed by the U.S. Forest Service and the State as a free-flowing stream. A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value; present or future endangered or threatened species of wildlife or vegetation will be identified and protected, water quality will be improved due to increased and improved sanitary facilities; State standards will be met, scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced, and future development choices will be lost	In addition to the NED benefits, the project will generate $50,000 in regional benefits as a result of increased employment income and $80,000 as a result of induced business in the region and other secondary effects.	The project will provide facilities in an area where facilities are limited in number. The project will give local residents the opportunity to fish, picnic, and have access to the stream. Local business establishments will profit from increased tourist trade. The project will allow tourists to make use of the facilities and recreational opportunities and, therefore, relieve some of the pressure placed on facilities near or in Yellowstone Park. Operation and maintenance of the project will provide for additional full-time jobs
RECREATION **Clarks Fork River** Recreation Component 1—From the Wyoming border down to Crandall Creek Bridge is 20 miles. Designation as a national recreational river with one major access site and one minor access area is proposed. Acquire scenic easements on 440 acres.	First Cost $524,000 Annual Equiv. Cost $73,200 Annual Benefits $108,800	*CLARKS FORK BASIN* A higher level of recreational use will be offset by the protection of resources; endangered or threatened species will be protected, excellent water quality will be maintained; development will result in some loss of options for future uses but will not involve irreversible or irretrievable effects, natural beauty along this stretch of river will be maintained, interpretation will enhance public use value; and historical and cultural use values, particularly in connection with the Nez Perce Trail, will be protected	In addition to NED benefits, regional employment benefits of about $55,000 and induced and stemming from benefits of about $100,000 will be realized from component 1 Corresponding figures for component 2 will be about $45,000 and $95,000 Corresponding figures for component 3 will be about $135,000 and $105,000 Use of the facilities will create a market for recreation-type goods and services	Recreational facilities in the Yellowstone Park area are becoming overcrowded. Protection of this scenic area and the expansion of its use will improve the quality of the recreation experience in other areas that would otherwise be overcrowded. The operation and maintenance of the new facilities will provide at least four full-time and four part-time jobs. Tourists using the area and its facilities will improve business opportunities in the service area. Additional access and facilities in the lower Clarks Fork will permit more local use of the resource and will attract some nonlocal use and relieve the pressures on other recreational facilities in the Yellowstone Park area
Component 2—From the Crandall Creek Bridge to the mouth of Clarks Fork Canyon is 22 miles. National designation as a wild and scenic river with two major access sites and one minor access area is proposed. No land acquisition is required.	First Cost $372,000 Annual Equiv. Cost $65,600 Annual Benefits $93,100			

TABLE 50, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Component 3—From the mouth of Clarks Fork Canyon to the Montana State line is 20 miles. Maintain the area as a private public-owned stretch. Acquire one additional major access site and one minor access area Easements will be needed on 2,640 acres to assure that areas near the river remain in essentially their present status and use. This area should be included in the State recreation river system if one is established	First Cost $2,124,000 Annual Equiv Cost $182,600 Annual Benefits $76,500			
High Country Lakes Preservation				
Preservation Classify Beartooth area north of U.S Hwy 212 as a wilderness area All of the land is contained within Shoshone National Forest	Not Available	This is a natural extension of an area in Montana being considered for designation as a wilderness area This fragile area with many lakes needs protection which cannot be classified easily Designation will preclude dams to increase capacity of natural lakes for additional storage.	Not Available	Preservation of this remarkably scenic area will be of benefit to this and succeeding generations. Places of quiet and solitude are becoming fewer
Off-stream Storage Clarks Fork Basin				
Recreation, fish, and wildlife A 6,500 acre-foot water storage reservoir will provide water for instream flow regulation and maintenance of a recreational pool.	First Cost $1,353,300 Total Annual Cost $91,450 Annual Benefits $93,300	The project will create a reservoir with a surface area of 320 acres and will create some goose and duck resting areas Waste grains will provide waterfowl food The average annual streamflow will be slightly reduced because of evaporation but flood flows will be reduced and low flows increased.	In addition to the NED benefits, the project will generate $30,035 in regional benefits as a result of increased employment income and $93,300 as a result of induced business and other secondary effects in the region	During construction demands on items such as housing, waste facilities, schools, and health services could cause some economic and emotional stress on area residents; but the project is relatively small and can be handled without undue hardship. After development, use of the facility will involve more people in the area and more expenditures for services and equipment.

Sunlight-Crandall Basin				
Establish development control programs Buy development rights or easements that will permit current uses, but will provide controls over and above any zoning regulations on future use of land for subdivision or other purposes	First Cost $6,000,000 Annual Cost $450,000 Annual Benefits $450,000	Scenic areas in the Upper Clarks Fork are recognized as those of more than local concern Provisions for scenic easements will encourage retention of scenic values while land remains on local tax roles and existing uses can continue without undue outside pressures for change	The land easements will not affect present uses, taxes, or other effects of private ownership, except that such uses and effects will remain for at least the 100-year life of the easements The land use contract programs will maintain the area's scenic and recreational values and thus perpetrate the State-regional values that currently exist	"The richest values of wilderness lie not in the days of Daniel Boone, not even in the present, but rather in the future "—Aldo Leopold All recreational areas will undoubtedly receive much heavier use in the future. It is important that they remain for this use—recreation—and not become developed for timber interests, vehicular uses, water projects, or housing developments The Sunlight Crandall area is one of the few readily accessible areas in the United States that still provides an opportunity to see and enjoy nature as it was before man's onslaught
LAND CONSERVATION		*BASINWIDE*		
Accelerated Land Conservation A State and Private Lands 1,432,000 Acres B National Resource Lands 556,000 Acres C. Forest Service Lands 5,540 Acres	A Cap. Cost $25,916,000 *Ann Equiv Cost $2,100,200 B Cap Cost $6,600,000 *Ann. Equiv Cost $534,900 C Cap Cost $3,959,000 *Ann. Equiv Cost $320,800 Annual Benefits—not computed—assumed to be at least equal to costs. *6⅛ percent interest for 25 years	Additional reduction of soil loss and sediment yield Increased vegetative cover results from improved management of existing resources Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries Reduce soil nutrients from entering streams and the underground water table Reduction of lundesirable return flows to streams Late season streamflows will be increased through the reduction of overland surface flows, increased soil infiltration, and moisture-holding capabilities.	Maintain and enhance the output of goods and services to users in the region	Improved downstream water quality for all uses Improve general esthetics of the land

TABLE 51
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, NORTHEAST WYOMING

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
RECREATION		*TONGUE BASIN*		
South Tongue River Recreation including the East and West Forks From source to the South Fork Reservoir is 37 miles and is designated as a scenic or recreational river. Administrative designation as a national, scenic, or recreational river under the management of the U.S Forest Service is proposed, and no land acquisition is necessary since the river flows entirely within Federal lands. There are 3 camp groups on the South Tongue with a total of 67 units and 1 picnic ground with 26 units. This appears to be adequate and, therefore, this plan does not include any costs for facility development.	First Cost 0 Annual Equivalent Cost $42,200 Annual Benefits[a] $132,750 a. Does not include fish and wildlife benefits	The scenic beauty along 27 miles of the designated scenic and recreational river will be preserved and managed by the U.S. Forest Service as a free-flowing stream. A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value, present or future endangered or threatened species of wildlife or vegetation will be identified and protected; water quality will be improved due to increased and improved sanitary facilities; State standards will be met, scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced, and future development choices will be lost	In addition to the NED benefits, the project will generate $52,800 in employment benefits and $100,000 as a result of induced business in the region and other secondary effects.	The river and its environment offer visitors and residents recreational opportunities such as fishing, hunting, camping, picnicking, sightseeing, canoeing, rafting, nature study, and other water-related activities. The pleasures associated with river-oriented recreation are important to social well-being. Recreation opportunities along pleasant streams renew human vitality. Local business establishments will profit from increased tourist trade
Tongue River Recreation				
Component 1—From source to the national forest boundary is 26 miles and is designated as a scenic or recreational river. National designation as a scenic or recreational river with one major access site and one boater access area is proposed, and no land acquisition is necessary	First Cost $216,000 Annual Equiv. Cost $59,700 Annual Benefits $67,600	The scenic beauty along 26 miles of the nationally designated scenic or recreational river will be preserved as a freeflowing stream. A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value, present or future endangered or threatened species of wildlife or vegetation will be identified and	In addition to the NED benefits, the project will generate $55,392 in employment benefits and $67,600 as a result of induced business in the region and other secondary effects.	The river and its environment offer visitors and local residents recreational opportunities such as fishing, hunting, camping, picnicking, sightseeing, canoeing, rafting, nature study, and other water-related activities. The pleasures associated with river-oriented recreation are important to social well-being. Recreation opportunities along

since this component flows entirely within Federal lands.		protected, water quality will be improved due to increased and improved sanitary facilities; State standards will be met; scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced; and future development choices will be lost.		pleasant streams renew human vitality. Operation and maintenance of facilities will provide additional full-time jobs. Local business establishments will profit from increased tourist trade.
Component 2—From the national forest boundary to the Montana-Wyoming border is 35 miles and is designated as a recreational river. State designation as a recreational river with one major access site and two minor access areas is proposed.	First Cost $1,828,700 Annual Equiv. Cost $197,200 Annual Benefits $189,000	The scenic beauty along 35 miles of the State designated recreational river will be preserved as a free-flowing stream. A higher level of recreation will be offset by the protection of resources; interpretation will enhance public use value; present or future endangered or threatened species of wildlife or vegetation will be identified and protected, water quality will be improved due to increased and improved sanitary facilities; State standards will be met, scenic, recreational, and wildlife options will be maintained, scenic and recreational values will be preserved and enhanced; and future development choices will be lost.	In addition to the NED benefits, the project will generate $103,686 in employment benefits and $189,000 as a result of induced business in the region and other secondary effects.	This portion of the Tongue River offers visitors numerous on- and off-river recreation opportunities. The pleasures associated with river-oriented recreation are important to social well-being. Recreation opportunities along pleasant streams renew human vitality. Operation and maintenance of facilities will create additional full-time jobs. Local business establishments will profit from increased tourist trade.
ENERGY CONSERVATION				
Coal production and conversion Develop and implement a plan to reduce 1975-2000 energy consumption by at least 25 percent under what it will be if rates of per capita growth continue as they have in the past.	Numerical values for costs and benefits are not available but it is self-evident that savings in energy demand will reduce required investments in production, transportation, and conversion facilities. Probably more important are the savings in environmental degradations and the conservation of resources that are becoming increasingly scarce.	A savings of 25 percent in coal production in the region will eliminate the need for 50 million tons of coal per year, a dozen coal trains out of Wyoming each day, or a slurry pipeline of air pollutants over 30,000 tons annually, housing and services for over 5,000 additional people, and a proportionate share of other environmental problems associated with coal production and conversion.	The reduced demand for coal will decrease the revenues to the State and region but will also reduce the demand for services somewhat. The decreased production will have little effect on the types of water and related land resource developments that will be needed under the State-regional development program.	A decrease in the number of people coming into the area will lessen the pressures on existing service facilities so that the quality of service will be higher. Average incomes will be somewhat lower. The needs for secondary service facilities—stores, plumbers, doctors, etc., will decrease.

TABLE 51, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, EQ PLAN, NORTHEAST WYOMING

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ACCOUNT: ENVIRONMENTAL QUALITY	ACCOUNT: STATE-REGIONAL DEVELOPMENT	ACCOUNT: SOCIAL WELL-BEING
ENERGY DEVELOPMENT				
Coal production and conversion A low level of development involves production of 74.0 million tons of coal per year by 1985 and continuing at the same level to 2000. The 390 megawatts of electric generating capacity now available will remain in use until 2000, but no new capacity will be added. Virtually, all coal produced under this plan will be exported by rail.	First Costa $295,000 Annual Cost NA Annual Benefits NA National costs for energy will increase somewhat because the Nation will be deprived of a major portion of its cheapest fuel source a. All costs and benefit figures are exclusive of transportation and relate only to the region	About 233 tons of particulates, 1,940 tons of sulphur oxides, and 194 tons of nitrous oxides will be discharged each year. About 2,600 acres of land will be used for energy-related developments. Water consumption will amount to 5,000 acre-feet for 1985 and 2000, respectively. At this level of development, it will take about 20 coal trains per day (each way) to move coal out of the area.	Tax and other revenues from coal production will amount to about $1.2 million annually through 2000. The tax base for the area will increase by about $300 million not including the value of residential and commercial facilities that will result from the development. Public facilities such as schools, libraries, medical institutions, water and sewage plants, etc., will be taxed to meet expanding loads but the new employment will involve only about 1,000 people so impacts of people will not be too severe.	Average incomes may increase slightly. In the long run, services will probably deteriorate as the area struggles to keep up with growing social loads. Without the economic gains that will be associated with more intensive resource developments the life-style of the area will be least disturbed by this relatively low level of development.
LAND CONSERVATION		*BASINWIDE*		
Accelerated Land Conservation A. State and Private Lands 5,472,000 Acres B. National Resource Lands 217,000 Acres C. Forest Service Lands 110,100 Acres	A. Cap. Cost $32,427,000 *Ann. Equiv. Cost $2,627,900 B. Cap. Cost $2,562,000 *Ann. Equiv. Cost $207,600 C. Cap. Cost $2,009,000 *Ann. Equiv. Cost $162,800 Annual Benefits—not computed—assumed to be at least equal to costs *6⅜ percent interest for 25 years.	Additional reduction of soil loss and sediment yield above future-without condition. Increased vegetative cover results from the improved management of existing resources. Improved quality of fish and wildlife habitat including cover, forage, watering places, waterfowl nesting sites, and establishment of fisheries. Reduce soil nutrients from entering streams and the underground water table. Reduction of undesirable return flows to streams. Maintenance of late season streamflows through reduction of overland surface flows and increased soil moisture storage.	Maintain and enhance the output of goods and services to users in the region. Provide additional employment in the application and maintenance of proposed measures. Provide additional permanent employment in processing increased goods and services	Improved downstream water quality for all uses Improve general esthetics of the land

Table 52
EQ Energy Development Resource Requirements and Air Pollution Emissions

Development	Unit	Tongue-Powder Montana		Lower Yellowstone Montana		North Dakota		Northeast Wyoming		Study Area Total	
		1985	2000	1985	2000	1985	2000	1985	2000	1985	2000
Coal Production	Million tons/year	16	16	59	59	19	19	75	132.0	228	226
Exports	Total million tons/year										
Rail	Million tons/year	16	16	55	55	—	—	73.57	100 2	144 57	171.2
Slurry	Million tons/year	0	0	0	0	0	0	0	25	0	25
Conversion											
Thermal Electric	Million tons/year	0	0	4	4	19	19	1.43	6.83	—	29 83
Capacity	Megawatts	0	0	950	950	2,514	2,499	2,390	390	24 43	3,839
Generation	Gigawatts	0	0	5,915	5,815	15,434	15,342	2,392	12,913	23,741	34,070
Syngas	Million tons/year	0	0	0	0	0	0	0	0	0	0
Capacity (Hi-BTU)	Million cubic feet/day	0	0	0	0	0	0	0	0	0	0
Water Requirements	Total acre-feet	1,216	1,216	20,740	20,740	41,798	41,568	4,890	50,216	68,644	113,740
Mines	Acre-feet/year	320	320	1,180	1,180	380	380	1,490	1,549	3,370	3,429
Reclamation	Acre-feet/year	896	896	5,310	5,310	2,831	2,831	2,117	2,383	11,154	11,420
Coal Gasification	Acre-feet/year	0	0	0	0	0	0	0	0	0	0
Electrical Generation	Acre-feet/year	14,250	0	14,250	14,250	38,587	38,357	1,283	31,284	68,370	83,891
Slurry Lines	Acre-feet/year	0	0	0	0	0	0	0	15,000	0	15,000
Labor Requirements											
Operating											
Mines	Man years/year	328	328	1,209.5	1,209.5	130	130	1,490	2,446	3,157.5	4113 5
Electrical Generation	Man years/year	0	0	124	124	186	186	50	312	360	622
Syngas	Man years/year	0	0	0	0	0	0	0	0	0	0
Capital											
Mines	Million dollars	91.2	91.2	336.3	336.3	92	92	295	3,821	814 5	4,340 5
Electrical Generation	Million dollars	0	0	0	0	437	437	0	66	437	503
Syngas	Million dollars	0	0	0	0	0	0	0	0	0	0
Land Requirements											
Strip Mines	Acres/year	230.4	230.4	849 6	849.6	728	728	543	2,960	2,348	4,768
Sites											
Mines	Acres	480	480	1,170	1,170	570	570	2,264	4,034	4,484	6,254
Electrical Generation	Acres	0	0	950	950	2,517	2,502	390	2,390	4,807	5,840
Syngas	Acres	0	0	0	0	0	0	0	0	0	0
Air Pollution Emissions											
Particulates	Tons/year	0	0	2,913	2,913	7,717	7,671	1,196	6,454	11,526	17,038
Sulfur Oxides	Tons/year	0	0	34,956	34,956	92,604	92,052	14,356	17,467	153,442	144,475
Nitrogen Oxides	Tons/year	0	0	29,130	29,130	77,170	76,710	11,963	64,554	118,263	170,394

The State-Regional Development Plan

The State-Regional Development (SRD) Plan involves those projects or programs that should be carried forward under the auspices of local or State jurisdictions. These program items are too complex, too large, or too financially involved to warrant their development by individuals. Often, but with a few exceptions, they do not meet the basic requirement for national economic development because the direct user benefits do not exceed the costs. They have regional values in excess of their costs, however, when the secondary effects of increased community income, improved services, induced business activities, and other such factors are considered in addition to NED benefits. From the regional point of veiw, the secondary effects are just as important as the primary ones—the impact on the local area irrespective of whether there may be offsetting effects somewhere else in the Nation. It should be noted, however, that there may be regional costs incurred as a result of the developments that are not reflected in the NED costs and have not been evaluated in these studies.

The projects and programs covered in the following tables are those that could appropriately be handled at the State level.

The beneficial and adverse effects of the SRD elements are displayed in tables 53 through 57 for each of the five planning areas where SRD elements were developed.

TABLE 53

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, UPPER YELLOWSTONE

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
AGRICULTURE (Irrigation) **Seven Mile-Sitting Bull Unit** USBR Report on Yellowstone Division	First Cost $10,449,000 Annual Benefits $590,000 Annual Cost $719,000	Improved upland game bird hunting and improved habitat for muskrats and mink in drains. Return flows will increase TDS in the receiving stream.	User Benefits $590,000 Regional Benefits $744,000 Net Benefits $615,000	Dryland farmers who will receive irrigation water will develop more stable operations due to increased reliability of water source. Fluctuations in annual income will lessen

TABLE 54
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, LOWER YELLOWSTONE

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
AGRICULTURE (Irrigation)				
Hay Creek Unit				
USBR Single-purpose Irrigation Study of the Yellowstone River Basin Treasure and Rosebud Counties	First Cost $6,632,500 Annual Benefits $451,200 Annual Cost $568,600	Most of these benchlands are presently under cultivation. Section 16—a school section—is a historic site.	User Benefits $451,200 Regional Benefits $424,300 Net Benefits $306,900	These pumping projects will add to the agricultural economy—income and employment Construction impacts are minimal
Forsyth Unit				
USBR Single-purpose Irrigation Study of the Yellowstone River Basin Rosebud County	First Cost $11,180,000 Annual Benefits $864,000 Annual Cost $954,500	Most of the unit is already cultivated, there is some interspersion of grasslands, and some habitat may be destroyed.	User Benefits $864,000 Regional Benefits $783,400 Net Benefits $692,900	Same as above
Fallon Bench				
USBR Single-purpose Irrigation Study of the Yellowstone River Basin Prairie County	First Cost $14,429,800 Annual Benefits $1,053,000 Annual Cost $1,253,700	The majority of the area appears to be cultivated and no wildlife problems are likely.	User Benefits $1,053,000 Regional Benefits $981,200 Net Benefits $780,500	Same as above
Broadview Bench Unit				
USBR Single-purpose Irrigation Study of the Yellowstone River Basin Prairie County	First Cost $7,432,400 Annual Benefits $611,500 Annual Cost $657,900	Most of the area is currently under cultivation, but some new plowing may be necessary.	User Benefits $611,500 Regional Benefits $558,100 Net Benefits $511,700	Same as above
War Dance Unit				
USBR Single-purpose Irrigation Study of the Yellowstone River Basin Dawson County	First Cost $2,323,000 Annual Benefits $136,000 Annual Cost $176,000	Most of this area is already in crops and no major wildlife problems are likely	User Benefits $136,000 Regional Benefits $132,200 Net Benefits $92,200	Same as above

TABLE 55

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, NORTH DAKOTA TRIBUTARIES

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
AGRICULTURE (Irrigation)				
Hazen-Stanton Unit Irrigation of 12,650 acres.	First Cost $24,806,000 Annual Benefits $1,192,900 Annual Cost $1,845,500	Additional habitat for small aquatic furbearing animals and upland game birds. Reduced wind erosion and increased productivity Structures will impair visual intrusions in the area. Return flows will add 13,409 tons of total dissolved solids annually. This unit is estimated to take 51 miles of canals and 63 miles of drains for a total of 126 acres of water	Total Benefits $1,930,500 Total Adverse Effects $1,845,500	The project will help stabilize the local economy Influx of 298 construction workers and their families with 33 school-age children for 3 years.
Oliver-Sanger Unit Irrigation of 8,000 acres.	First Cost $15,464,000 Annual Benefits $750,000 Annual Cost $1,181,200	Additional habitat for small aquatic furbearing animals and upland game birds. Reduced wind erosion and increased productivity Structures will impair visual intrusions in the area Return flows will add 8,438 tons of total dissolved solids annually. This unit is estimated to take 44 miles of canals and 32 miles of drains for a total of 88 acres of water.	Total Benefits $1,839,400 Total Adverse Effects $1,181,200	The project will help stabilize the local economy Influx of 186 construction workers and their families with 21 school-age children for 3 years
Upper Portion of Painted Woods Unit Irrigation of 610 acres.	First Cost $1,358,000 Annual Benefits $59,200 Annual Cost $97,500	Additional habitat for small aquatic furbearing animals and upland game birds. Reduced wind erosion and increased productivity Structures will impair visual intrusions in the area. Return flows will add 647 tons of total dissolved solids annually. This unit is estimated to take 2 miles of drains and 2 miles of canals for a total of 5 acres of water.	Total Benefits $149,400 Total Adverse Effects $97,500	The project will help stabilize the local economy Influx of 25 construction workers and their families for 2 years

TABLE 55, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, NORTH DAKOTA TRIBUTARITES

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Little Heart Unit				
Irrigation of 3,100 acres.	First Cost $4,569,000 Annual Benefits $301,000 Annual Cost $344,800	Additional habitat for small aquatic furbearing animals and upland game birds. Reduced wind erosion and increased productivity Structures will impair visual intrusions in the area. Return flows will add 3,286 tons of total dissolved solids annually. This unit is estimated to take 16 miles of canals and 12 miles of drains for a total of 34 acres of water.	Total Benefits $686,000 Total Adverse Effects $344,800	The project will help stabilize the local economy Influx of 84 construction workers and their families with 9 school-age children for 3 years
Fort Yates Unit				
Irrigation of 4,260 acres.	First Cost $6,365,000 Annual Benefits $412,600 Annual Cost $500,600	Additional habitat for small aquatic furbearing animals and upland game birds. Reduced wind erosion and increased productivity Structures will impair visual intrusion in the area. Return flows will add 4,516 tons of total dissolved solids annually. This unit is estimated to take 21 miles of canals and 17 miles of drains for a total of 45 acres of water	Total Benefits $945,400 Total Adverse Effects $500,600	The project will help stabilize the local economy. Influx of construction workers and their families with school-age children for 3 years
Bronco Reservoir				
Irrigation of 10,000 acres.	First Cost $42,450,000 Annual Benefits $1,116,000 Annual Cost $3,012,000	A reservoir of 3,400 acres will be created. Water-oriented recreational activities will be available. Fishing in the Knife River below the dam will be slightly improved. Waterfowl resting habitat will be improved. Wind erosion will be reduced. Up to 4,650 acres of natural grassland, farmland, and wooded riparian habitat will be inundated by the	Total Benefits $3,398,000 Total Adverse Effects $3,012,000	

		reservoir. Structural features and exposed bankline during drawdown periods will be visual intrusions to the area. There will be some reduction in hunting opportunities. From 10 to 20 miles of free-flowing stream habitat will be lost. Construction activities will create some temporary dust and aerial exhaust emissions.		
Cannonball Division Cannonball Unit 21,000 acres of irrigation below Cannonball, Thunderhawk, and Mott Dams.	First Cost $25,111,000 Annual Benefits $1,100,000 Annual Cost $1,774,500	A reservoir of 3,150 acres will be created. Water-oriented recreational activities will be available. Opportunities for pheasant hunting could improve. There will would be a fair potential for establishing a reservoir fishery. At the flood storage level, 21,950 acres will be inundated. Visual quality will be reduced from construction of the irrigation facilities. Several miles of free-flowing streams will be impounded.	Total Benefits $2,793,000 Total Adverse Effects $1,774,500	The project will help stabilize the local economy Influx of 225 construction workers and their families with 57 school-age children for 4 years.
Cannonball Division Thunderhawk Unit See above	First Cost $18,621,000 Annual Benefits $539,000 Annual Cost $1,293,000	A reservoir of 3,100 acres will be created. Water-oriented recreational activities will be available. Opportunities for pheasant hunting could improve. There will be a fair potential for establishing a reservoir fishery. At the flood storage level, 12,300 acres will be inundated. Visual quality will be reduced from construction of the irrigation facilities. Several miles of free-flowing streams will be impounded	Total Benefits $1,565,000 Total Adverse Effects $1,293,000	The project will help stabilize the local economy. Influx of 267 construction workers and their families with 57 school-age children for 4 years

TABLE 55, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, NORTH DAKOTA TRIBUTARITES

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Cannonball Division				
Mott Unit See page 155	First Cost $29,305,000 Annual Benefits $638,000 Annual Cost $2,017,000	A reservoir of 3,400 acres will be created Water-oriented recreational activities will be available. Opportunities for pheasant hunting could improve. There will be a fair potential for establishing a reservoir fishery At the flood storage level, 13,700 acres will be inundated Visual quality will be reduced from construction of the irrigation facilities. Several miles of free-flowing streams will be impounded	Total Benefits $2,134,000 Total Adverse Effects $2,017,000	The project will help stabilize the local economy Influx of 263 construction workers and their families with 89 school-age children for 4 years
FLOOD CONTROL				
Mott Local Protection Project 2.0 miles of levees and 0.6 miles of channel improvement on Cannonball River.	First Cost $2,215,000 Annual Benefits $112,000 Annual Cost $153,000	Three acres of clearing and grubbing will reduce wildlife habitat. Improved weed reduction, better drainage, and mosquito control.	Total Benefits $179,000 Total Adverse Effects $153,000	Protecting 140 acres of urban land and improvements from flooding will enhance the health and social well-being of 1,300 residents.

TABLE 56

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
MULTIPURPOSE		*WIND RIVER BASIN*		
Sand Mesa Project Wildlife habitat and irrigation Two small reservoirs for wildlife habitat and 1,690 acres of sprinkler irrigation will provide wildlife feed crops or will be harvested as circumstances each year dictate.	First Cost $1,429,000 Annual Equiv. Cost $44,200 Annual Benefits $58,000	Farming of the area could leave large areas exposed to wind erosion during the fall, winter, and spring. The SCS soils classification shows that the predominant soils of the area are prone to wind erosion. The two small reservoirs will provide nesting habitat for Canadian geese that is expected to result in the annual production of about 250-300 goslings per year by 1982. The ponds will also provide resting areas for migrant waterfowl. The irrigated area will provide a more accessible feed supply for the waterfowl. Unharvested crops and fringe areas will provide habitat necessary for increased production of pheasants, Hungarian partridge, and other upland game and songbirds.	In addition to the direct user (NED) benefits, the project will generate employment benefits of about $62,000 annually and induced and stemming from benefits of about $162,000, the regional cost-benefit ratio will be about 2.7 to 1.	The increased irrigated acreage will increase the total agricultural returns to the area by about $120,000 annually. Community income will increase by about $224,500 annually due to increased employment and business generated by the project installations and operations. Project installation, operation, and maintenance will provide increased full-time employment, and increased agricultural output will create new seasonal on-farm jobs and generate additional full-time jobs in the agribusiness industry of the region. The enhanced wildlife production will provide the base for increased employment in the service sectors dealing with tourism and hunting. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region. The increased wildlife population will provide increased opportunity for viewing wildlife as well as increased hunting.

TABLE 56, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
AGRICULTURE (Irrigation)				
Green Valley Ranches Project Irrigation Sprinkler irrigation will be provided for 5,100 acres of land. Water will be pumped directly from Boysen Reservoir to lands north of Shoshone for sprinkler application.	First Cost $7,393,100 Annual Equiv. Cost $472,300 OM&R $57,800 Total Annual Cost $530,100 Annual Benefits $359,900	Reservoir levels in the Boysen Reservoir might be lower due to irrigation withdrawal. About 5,100 acres of rangeland will be converted to irrigated agricultural land, the area is antelope habitat. Farming of the area will leave large areas exposed to wind erosion during the fall, winter, and spring. Increased crop acreage will increase the upland game and songbird habitat.	User Benefits $359,900 Regional Benefits Employment $354,400 Induced and Stemming From $81,100 Total Benefits $795,400 Adverse Effects Investment $472,300 OM&R $57,800 Total Cost $530,100	The increased irrigated acreage will increase the total agricultural returns to the farmers of the area. Community income will be increased an average of $265,300 annually because of increased employment and business generated by the project installation and output. Project installation, operation, and maintenance will provide increased full-time employment in agriculture. Production of increased agricultural output will create new seasonal on-farm jobs. Increased agricultural output will generate additional full-time jobs in the agribusiness industry of the region. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.
Kirby Draw Project Irrigation The Kirby Draw Project is an 11,200-acre sprinkler irrigation project. Water will be pumped from the Wind River using two river pump plants.	First Cost $13,579,800 Total Annual Cost $1,025,100 Annual Benefits $675,500	Streamflow levels will be depleted due to the irrigation diversion. About 11,200 acres of rangeland will be changed to irrigated agriculture. The area is antelope and sage grouse habitat. Farming of the area will leave large areas exposed to wind erosion during the fall, winter, and spring. Increased crop acreage will increase the upland game and songbird habitat.	In addition to the NED benefits, the project will generate $1,567,900 in regional benefits as a result of increased employment income, induced business in the area, and other secondary effects.	The increased irrigated acreage will increase the total agricultural returns to the farmers of the area. Community income will be increased an average of $1,218,300 annually because of increased employment and business generated by the project installation and output. Project operation and maintenance will provide increased full-time employment in agriculture. Production of increased agricultural output will create new seasonal on-farm jobs and will generate additional full-time jobs in the agribusiness industry and service sector of the region. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.

Mule Butte Project Irrigation The project will sprinkler irrigate about 17,280 acres of land with water supplied from the Wind River. A three-pumping-plant system will be used.	First Cost $25,343,800 Total Annual Cost $2,028,500 Annual Benefits $1,042,300	Streamflow levels will be depleted due to the irrigation diversion. About 17,280 acres of antelope and sage grouse habitat will be lost. Farming of the area will leave large areas exposed to wind erosion during the fall, winter, and spring. Increased crop acreage will increase the upland game and songbird habitat.	In addition to the NED benefits, the project will generate $2,576,600 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	The increased irrigated acreage will increase the total agricultural returns to the farmers of the area. Community income will be increased an average of $1,590,400 annually because of increased employment and business generated by the project installation and output. Project installation, operation, and maintenance will provide increased full-time employment in agriculture. Production of increased agricultural output will generate additional full-time jobs in the agribusiness industry and will create new seasonal on-farm jobs. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.
North Hudson Project Irrigation The project is a sprinkler irrigation project of about 6,200 acres. Water will be pumped from the Popo Agie River using one river pumping plant.	First Cost $7,972,000 Total Annual Cost $674,100 Annual Benefits $396,700	Streamflow levels will be depleted due to the irrigation diversion. About 6,200 acres of antelope and sage grouse habitat will be lost. Farming of the area will leave large areas exposed to wind erosion during the fall, winter, and spring. Increased crop acreage will increase the upland game and songbird habitat.	In addition to the NED benefits, the project will generate $937,500 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	The increased irrigated acreage will increase the total agricultural returns to the farmers of the area. Community income will be increased an average of $660,100 annually because of increased employment and business generated by the project. Project installation, operation, and maintenance will provide increased full-time employment in agriculture. Production of increased agricultural output will create new seasonal on-farm jobs as well as generate additional full-time jobs in the agribusiness industry and service sector of the region. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.

TABLE 56, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Preacher Draw-Beaver Creek				
Irrigation The project will sprinkler irrigate 7,400 acres of land. Water will be supplied by two river pumping plants, one on the Popo Agie River and one on the Little Wind River.	First Cost $9,529,000 Total Annual Cost $765,600 Annual Benefits $473,500	Streamflow levels will be depleted due to the irrigation diversion. About 6,200 acres of antelope and sage grouse habitat will be lost. Farming of the area will leave large areas exposed to wind erosion during the fall, winter, and spring. Increased crop acreage will increase the upland game and songbird habitat.	In addition to the NED benefits, the project will generate $1,199,100 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	The increased irrigated acreage will increase the total agricultural returns to the farmers of the area. Community income will be increased an average of $907,000 annually because of increased employment and business generated by the project. Project operation and maintenance will provide increased full-time employment in agriculture. Production of increased agricultural output will create new seasonal on-farm jobs as well as provided increased full-time employment in the agribusiness industry and service sector of the region. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.
Winchester Project				
Irrigation Irrigation will be provided to 9,680 irrigable acres, using direct flows from the North Fork of Little Wind River and storage at Raft Lake. A 30-mile-long, 228-cubic-feet-per-second canal will be required to reach the irrigable land.	First Cost $16,183,000 Annual Cost $1,088,000 Annual Benefits $610,700 (Irrigation only)	Approximately 10,000 acres of rangeland will be converted to irrigated agriculture. Raft Lake which is in a particularly scenic area will be converted to storage use, but the site is almost entirely rock-rimmed so reservoir fluctuations will not create esthetic problems. Providing construction access to the site will be environmentally undesirable.	In addition to the NED benefits, the project will generate employment benefits of $257,000 annually and induced benefits of $474,500 annually for a total SRD benefit of $1,342,200.	The project will provide 30 to 50 new farm units with relatively high incomes. It will contribute to improved social and service facilities on the Wind River Indian Reservation and in off-reservation towns serving the area.

MULTIPURPOSE		*BIGHORN BASIN*		
Buffalo Bill Reservoir Enlargement Multipurpose Raising Buffalo Bill Dam 25 feet from its present height of 5,370 feet will provide a firm yield of 74,000 acre-feet annually for multipurpose uses. The total regulated storage capacity will be increased 271,300 acre-feet for a total of 695,400 acre-feet. The total surface area will be increased from 6,691 acres to 9,780 acres resulting in an increase of 3,089 acres. The existing 5.6-megawatt powerplant is obsolete and will be replaced with a new Shoshone Powerplant with a capacity of 20 megawatts. The spillway capacity will be enlarged from 18,000 cubic feet per second to 66,850 cubic feet per second. Water releases through Heart Mountain will allow an additional annual generation of 14 9 million kilowatt hours. Also, a visitor center will be constructed at the left abutment of the raised dam. In the upper reservoir, a dike system will be installed for dust abatement that will also have waterfowl enhancement areas.	First Cost $42,553,000 Total Annual Cost $2,964,300 Annual Benefits $2,594,000	Fishing opportunity above and below the reservoir will be increased by 9,700 fisherman-days. The use of 1,600 acres of irrigated land and 520 acres of pasture will be convertec to water storage. Public and private recreational facilities will be relocated. The dam has been declared a national historic landmark and modification will alter it somewhat. Seven archaeological sites in the reservoir area could be altered. Minimum flows from the dam to Heart Mountain Powerplant will be increased from 50 to 100 cubic feet per second and from 50 to 250 cubic feet per second below the powerplant. Shoreline will be increased 4 miles and water surface area will be increased a normal maximum of 3,089 acres resulting in 2,483 acres being inundated. Loss of inundated vegetation will result in a loss of wildlife population. The North Fork and South Fork of the Shoshone River will have 1 3 and 0 6 miles, respectively, inundated. Water contained in ponds behind the earthen dike system will help prevent annual flooding and draining, and therefore, cover dust-producing lands and reduce air quality problems during winter months. Impoundment areas will provide water fowl nexting areas and furbearing animal habitat. Wildlife observation opportunities will be increased.	In addition to the NED benefits, regional employment benefits will total $2,170,000 and regional induced and stemming from benefits will total $475,000. There will be net beneficial effects to the region of $255,000 and to the adjacent region in the amount of $691,000.	Employment of construction workers will vary from 20 to 250 during the 5-year construction period. Most workers will be imported but some semiskilled and unskilled workers will be employed from local forces. School-age children of construction workers could number from 20 to 200 during the 5-year construction period. Local schools will have to accommodate these students. Persons on fixed incomes could have reduced buying power if local prices increase during construction activity. A visitor center with audio and visual displays will provide historical and cultural information about the dam, reservoir, and surrounding area. Undesirable living conditions for local residents will be alleviated. The reservoir area will be more compatible with winter sports activities.

TABLE 56, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
AGRICULTURE				
Banjo Flats Project Irrigation Sprinkler irrigation will be provided for 10,400 acres of land. Water will be diverted through the Upper Hanover Canal then pumped to lands above the Highland Hanover Canal for sprinkler application.	First Cost $12,962,900 Annual Equiv. Cost $828,100 OM&R $270,600 Total Annual Cost $1,098,700 Annual Benefits $756,600	Streamflow of the Bighorn River will be decreased during the irrigation season. About 10,400 acres of antelope and sage grouse habitat will be lost. Farming of the area will leave areas exposed to wind erosion during the nongrowing season. Increased crop acreage will increase the upland game and songbird habitat.	User Benefits $756,600 Regional Benefits Employment $621,500 Induced and Stemming From $1,054,000 Total Benefits $2,432,100 Adverse Effects Investment $828,100 OM&R $270,600 Total Cost $1,098,700 Net Beneficial Effects $1,333,400	The increased irrigated acreage will increase and stabilize the total agricultural returns to the farmers. Community income will be increased an average of $1,333,400 annually because of increased employment and business generated by the project installation and output. Project installation, operation, and maintenance will provide increased full-time employment in agriculture and create new seasonal on-farm jobs, and generate additional full-time jobs in the agribusiness industry of the region. Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region.
Shoshone Extensions Unit (North) Polecat Bench Irrigation Water will be supplied to 19,200 acres of irrigable land on Polecat Bench, and 1,270 acres in Frannie Loop via the existing Shoshone Canyon Conduit and Heart Mountain Canal. Required facilities include a 212 cfs	First Cost $52,000,000 Total Annual Cost $3,401,000 Annual Benefits $3,058,000	Water quality will be affected by an increase in salinity due to return flows. Some upland game bird habitat and some aquatic furbearing animal habitat will be created in canals and laterals. Waste grains will provide waterfowl food. The project will allow maintenance of stable downstream flows. Strutting grounds of sage grouse will be eliminated in irrigated areas. The	In addition to the NED benefits, the project will generate $4,766,000 in regional benefits resulting from increased employment income, induced business in the region, and other secondary effects.	The construction of the project is estimated to be 8 years and involve 75 construction workers and 233 total people related to construction. Since the 1950's, the rural farm population in Park County has decreased about 9 percent. The project will encourage an additional 120-175 additional farm families to farm the area. Farm and community income will increase due to increased

siphon from the Heart Mountain Canal to Polecat Bench; the 120 cfs Kitty Canal, Holden Reservoir with 6,000 acre-feet of regulatory storage impounded by Holden Dam with a maximum height of 59 feet, the 155 cfs Holden Canal, and some modification of Heart Mountain Canal to carry the additional water.		project will create visual effects of canals, laterals, diversion dams, pumping plants, and access roads. A change in terrain due to irrigation and new farming methods will change natural habitat for some species of wildlife.		agricultural production and also become more stabilized. Some landowners may have irrigation features crossing their land and not gain any direct benefits from the project. The additional construction-related people may put a strain on housing, sewer and water systems, and somewhat on schools.
Shoshone Extension Unit (South)				
Irrigation The project calls for supplying water to irrigable land totaling 17,270 acres in the Shoshone Extension Unit (South). Exchange of water will be supplied to the Greybull Valley Irrigation District, so some of the water supply now available to the District could be used on YU Bench. Required facilities include the 500 cfs Oregon Basin Feeder Canal between the existing Buffalo Bill Reservoir and the proposed Oregon Basin Reservoir, the 400-cfs Dry Creek Canal from the Oregon Basin Reservoir to the lower Greybull Valley, the 292-cfs canal from the Greybull River to YU Bench, and related ditches, laterals, and other structures.	First Cost $42,366,000 Annual Equiv. Cost $2,930,300 Annual Benefits $2,085,400	Water quality will be affected by an increase in salinity due to return flows. Some upland game bird habitat and some aquatic furbearing habitat will be created in canals and laterals. Waste grains will provide waterfowl food. The project will allow maintenance of stable downstream flows. Strutting grounds of sage grouse will be eliminated in irrigated areas. The project will create visual effects of canals, laterals, diversion dams, pumping plants, and access roads.	In addition to the NED benefits, the project will generate $3,847,130 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	Employment of construction workers will average 222 and at peak construction will be about 415 during the 5-year construction period. Some workers will be imported, but most workers will be hired from the local and adjacent areas. Area schools will have to accommodate the children of the imported workers. Persons on fixed incomes could have reduced buying power if local prices increase during construction activity. Project operation and maintenance will provide an average of 15 full-time jobs. Production of increased agricultural output will create an additional 54 seasonal on-farm jobs. There will be an increase in commercial facilities and services needed to supply the requirements of increased irrigation farming and to process the increased produce. This will strengthen the employment base in the area.

TABLE 56, Continued
DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, WIND-BIGHORN-CLARKS FORK

PLAN ELEMENT	ACCOUNT: NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
Westside Irrigation Project[a b/]				
Irrigation Sprinkler irrigation will be provided for 25,000 acres of land. Diversion is through three river pumping plants to the Bighorn Canal. Lands lie above the Bighorn Canal and will be supplied by a pressure system pumping from the canal.	First Cost $19,207,000 Annual Equiv Cost Investment $1,227,000 OM&R $775,000 Total Annual Cost $2,002,000 Annual Benefits $2,300,000	About 25,000 acres of potential antelope and sage grouse habitat will be lost Farming of the area will leave large areas exposed to wind erosion during the fall, winter, and spring Increased crop acreage will increase the upland game and songbird habitat. Increased crop acreage will allow longer crop rotation for disease control, particularly in sugar beets. Streamflow depletions will have an adverse effect on the quality of municipal water available to Basin, Wyo. The river might be dewatered for short stretches below the river pumping plants.	User Benefits $2,300,000 Regional Benefits Employment $673,000 Induced and Stemming From $3,510,400 Total Benefits $6,483,000 Adverse Effects Investment $1,227,000 OM&R $775,000 Total Cost $2,002,000 Net Beneficial Effects $4,481,600	The project acreage will increase total agricultural returns to the farmers of the area Community income will increase an average of $4,481,000 annually because of increased employment and business generated by the project installation and output Economic conditions of the area will be stabilized through increased service industry activity associated with irrigated agriculture Project installation, operation, and maintenance will provide increased full-time employment in agriculture and create new seasonal on-farm jobs. Increased agricultural output will generate additional full-time jobs in the agribusiness industry of the region and generate additional full-time employment in the service sectors Increased income will allow beneficiaries to more actively participate in social, cultural, recreational, and community activities of the region. The project will provide added opportunity for young people to become farmers
Shoshone Extensions Unit (South Additions)[a/]				
McCollough Section Irrigation The project contains 1,110 acres of irrigable land which will be subdivided into 8 farm units. Water for	First Cost $746,000 Total Annual Cost $61,300 Annual Benefits $160,500	Water quality will be affected by an increase in salinity due to return flows. Some upland game habitat and some aquatic furbearing animal habitat will be created in canals and laterals. Waste grains will provide waterfowl food The project will allow maintenance of	In addition to the NED benefits, the project will generate $287,700 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	Employment of construction workers will average 11 and at peak construction will be about 20 during a 2-year or longer construction period. Some workers will be imported, but most workers will be hired from the local and adjacent areas. Project operation

a/ Ongoing rehabilitation work on the Bighorn Canal includes replacing a siphon with a new structure with enough capacity to carry the Westside water
b/ This project includes the land in the Bighorn Unit

irrigation will be supplied to 660 acres by gravity from a lateral which will divert from the Oregon Basin Feeder Canal and to 450 acres by pumping from that lateral. Required facilities include two pump lifts, one relift pump, and other related structures.		stable downstream flows. Strutting grounds of sage grouse will be eliminated in irrigated areas. The project will create visual effects of canals, laterals, diversion dams, pumping plants, and access roads.		and maintenance will provide an average of one full-time job. Production of increased agricultural output will create an additional four seasonal on-farm jobs. Area schools will have to accommodate children of the imported workers. Persons on fixed incomes could have reduced buying power if local prices increase during construction activity. There will be an increase in commercial facilities and services needed to supply the requirements of increased irrigation farming and to process the increased produce. This will strengthen the employment base in the area.
Shoshone Extensions Unit (South Additions)[a] Sage Section Irrigation Water for irrigation will be pumped from the Oregon Basin Feeder Canal to supply 2,140 acres of irrigable land which will be subdivided into about 15 farm units. Required facilities include two pumping plants, one relift plant, and other related structures.	First Cost $938,000 Total Annual Cost $82,200 Annual Benefits $211,300	Water quality will be affected by an increase in salinity due to return flows. Some upland game bird habitat and some aquatic furbearing animal habitat will be created in canals and laterals. Waste grains will provide waterfowl food. Strutting grounds of sage grouse will be eliminated in irrigated areas. The project will create visual effects of canals, laterals, diversion dams, pumping plants, and access roads.	In addition to the NED benefits, the project will generate $375,300 in regional benefits as a result of increased employment income, induced business in the region, and other secondary effects.	Employment of construction workers will average 11 workers and at peak construction will be about 20 during a 2-year or longer construction period. Some workers will be imported, but most will be hired from the local and adjacent areas. Project operation and maintenance will provide an average of one full-time job. Increased agricultural output will create eight additional seasonal on-farm jobs. Area schools will have to accommodate the children of the imported workers. Persons on fixed incomes could have reduced buying power if local prices increase during construction activity. There will be an increase in commercial facilities and services needed to supply the requirements of increased irrigation farming and to process the increased produce. This will strengthen the employment base in the area.

a/ Contingent on either construction of Shoshone Extensions South Unit or alteration of the Cody Canal System.

TABLE 56, Continued

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, NED PLAN, UPPER YELLOWSTONE

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
AGRICULTURE (Irrigation)		*CLARKS FORK BASIN*		
Off-stream Storage Irrigation A 6,500-acre-foot storage reservoir will provide a supplemental water supply of 1,920 acre-feet per year to Badger Basin Unit and an additional 3,820 acre-feet to the Cyclone Bar Project for irrigation purposes.	First Cost $1,353,300 Total Annual Cost $91,450 Annual Benefits for Off-stream Project[a] Badger Basin $30,600 Cyclone Bar $62,700 (Irrigation) $93,300 [a] Recreation, fish and wildlife, and other effects not evaluated.	The project will create a reservoir with a surface area of 320 acres and will create some goose and duck resting areas. Waste grains will provide waterfowl food. Average annual streamflow will be slightly reduced. The project will result in a loss of small amounts of sage grouse and antelope habitat. Project lands will be committed essentially forever. The project will create the visual effect of diversion dams, canals, and reservoirs.	In addition to the NED benefits, the project will generate $30,935 in regional benefits as a result of increased employment income and $93,300 as a result of induced business in the region and other secondary effects.	Farm income will increase and stabilize through implementation of the irrigation projects. General income levels of the surrounding area will increase from the construction funds. After construction, operation and maintenance will provide continued additional income to the area. Outmigration of young people will be reduced by increased agricultural employment. During construction, demands on items such as housing, streets, waste facilities, schools, and health services could cause an economic and emotional stress on area residents.

TABLE 57

DISPLAY OF BENEFICIAL AND ADVERSE EFFECTS, SRD ELEMENTS, NORTHEAST WYOMING

PLAN ELEMENT	ACCOUNT			
	NATIONAL ECONOMIC DEVELOPMENT	ENVIRONMENTAL QUALITY	STATE-REGIONAL DEVELOPMENT	SOCIAL WELL-BEING
MULTIPURPOSE				
Northeast Wyoming Water Project A coordinated water supply system for agriculture, industry, recreation, fish and wildlife, and other functions. The project will be developed in three stages to keep the investment and adverse effects to a minimum commensurate with needs. The first stage will involve a pumping plant on Clear Creek, a pipeline from the plant to a regulating reservoir near Gillette, and the regulating reservoir. Water will be delivered to users at the reservoir site. The second stage will involve development of a deep-well field near Moorcroft to obtain water from the Madison formation and a pipeline from the field to the regulating reservoir near Gillette. The third stage will involve construction of a 250,000-acre-foot reservoir on lower Clear Creek to firm up supplies for the Clear Creek-Rawhide pipeline and regulating reservoir	Annual Cost Stage One $4,278,300 Stage Two $2,493,800 Stage Three $9,514,000 Total $16,514,000 Benefits Stage One $4,475,000 Stage Two $5,000,000 Stage Three $9,787,500 Total $19,762,000	This project will eliminate the need for separate industrial and agricultural water storage and related pipeline and other facilities at sites on the Powder and Crazy Woman Creeks. Instream flows will be enhanced on the Powder and Clear Creeks and possibly on the Little Powder and other tributaries depending upon where return flows are ultimately channeled. A single pipeline will serve the same purposes as several that might otherwise be developed. About 3 miles of poor-quality fishing stream will be replaced by a reservoir fishery. A reservoir fishery and recreational water body will be provided near Gillette on a stream that has little or no recreational or fishery value now. Wildlife habitat in the reservoir areas will be destroyed.	Employment and induced benefits in the area will amount to some $5 million during the construction periods and about $2.5 million annually during the operating period	The quality of water available to Gillette and other communities in the region will be significantly improved. Average income in the area will increase as a result of the development that the project will permit.

CHAPTER 7

RECOMMENDED PLAN

Selection of Recommended Plan Elements

The recommended plan summarized in this chapter is the culmination of efforts to determine which projects and programs would best meet the needs described in chapter 4.

The procedures followed by the various planning area study teams in evaluating projects and programs for possible inclusion in the alternative NED, EQ, and SRD plans and, subsequently, for incorporation into the recommended plan are discussed in some detail in the preceding chapter. It is important to point out that most of the elements which ultimately became a part of the recommended plan were drawn from one or the other of the alternative plans, without modification. What follows is a list, by planning area, of those plan elements which *were modified* together with a brief explanation of the differences.

Upper Yellowstone

No modifications were made to those plan elements which moved to the recommended plan from either the NED plan, EQ plan, or SRD plan.

Clarks Fork-Bighorn

No modifications were made to those plan elements which moved to the recommended plan from either the NED plan or EQ plan.

Tongue-Powder

Energy Development—Energy development is included as part of both the NED plan and EQ plan; however, the recommended plan varies significantly in this development from both of the others. The recommended plan level of private energy development is lower than either the projected requirements or the NED level.

Most notable is the provision for export of coal by slurry pipeline from the planning area to eastern demand centers. Also, the level of synthetic coal gasification has been cut to one-fourth of that under the future without level; and then only on the condition that the single gas plant be privately funded and receive no government subsidy.

Lower Yellowstone

Energy Development—Energy development is included as part of both the NED plan and EQ plan; however, the recommended plan varies from both of the others. The recommended plan level is similar to the NED plan except that the coal export by slurry pipeline included in the NED plan is dropped.

North Dakota Tributaries

Energy Development—The NED plan calls for development sufficient to meet the Harza energy report "high" level demand but excludes coal gasification completely and coal slurry until after the year 2000. The EQ plan contains a modification of the "low" level Harza scenario, recognizing only those plants which have been constructed or are now (1978) under construction. The recommended plan adds all energy facilities having an approved water permit to the EQ plan version.

Wind-Bighorn-Clarks Fork

Sand Mesa Project—The recommended plan contains this plan element as described in both the NED and SRD plans. The EQ plan includes the Sand Mesa Project but limits the extent of sprinkler irrigation to 546 acres instead of the 1,690 acres proposed in each of the other plans.

Buffalo Bill Enlargement—The SRD plan version of this plan element was approved and adopted for the recommended plan. Both the NED and EQ plans contain the Buffalo Bill Enlargement proposal, but the scope of the project in each varies from the SRD plan. The NED plan does not include the upper reservoir dike system found in the recommended plan. The EQ plan does not include hydropower modification nor the visitor center construction.

Cyclone Bar Project—This plan element was transferred to the recommended plan from the NED plan with no change except in project costs. Estimated project cost in the NED plan is $1,133,900, while the recommended plan lists a cost of $285,400. This difference is the result of sharing reservoir storage with the off-stream storage project.

Off-Stream Storage-Clarks Fork Basin—The recommended plan provides 24,470 acre-feet of storage to provide a water supply for the Badger Basin Unit and Cyclone Bar project for irrigation (4,740 acre-feet), a supplemental supply for existing irrigation, 5,000 acre-feet dead storage, and 11,470 acre-feet for instream flow maintenance. The NED, EQ, and SRD plans include this plan element, but with a storage capacity of 6,500 acre-feet. Thus the recommended plan and costs exceed those of the other plans, with costs increasing from $1,353,300 to $5,534,700.

Northeast Wyoming

South Tongue Watershed—In both the NED and SRD plans, the South Tongue Prairie Dog project plan element contains provisions for irrigation, recreation, fish and wildlife, and industrial water supply at a cost of $24,497,000. The recommended plan omits this but contains a modified version of this proposal for the South Tongue Watershed in which only the irrigation and recreation needs are addressed at a cost of $4,787,000.

Display of Plan

A presentation of the recommended plan is accomplished through the maps and tables which follow. The planning area maps locate various plan elements and the tables summarize the cost information available on each element.

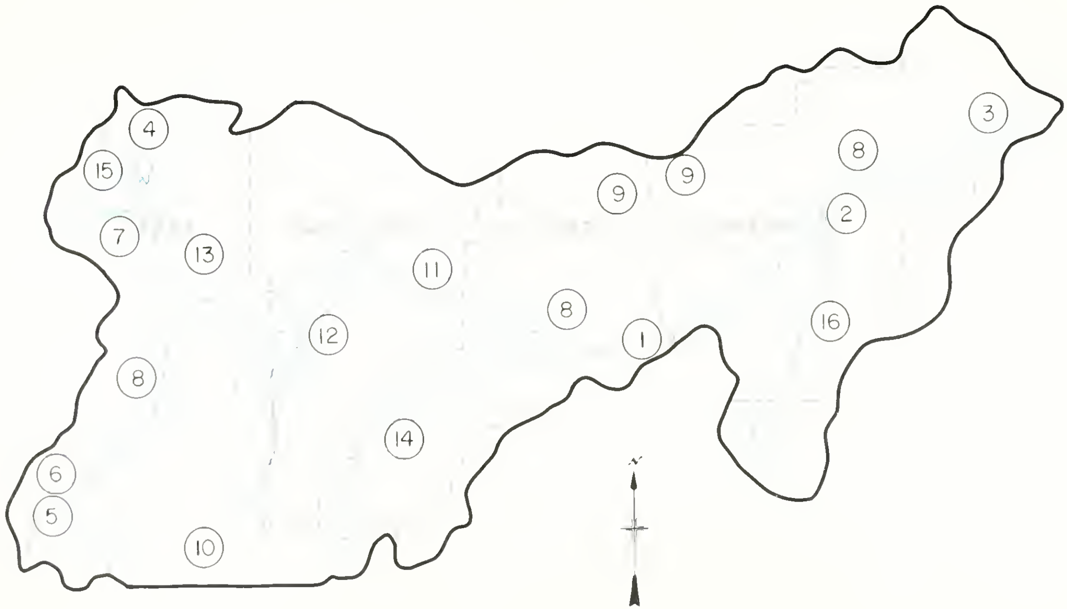
Table 58
Recommended Plan Elements, Upper Yellowstone

Plan Function/Element	Purpose	Initial Cost ($1,000)
AGRICULTURE		
White Horse Bench Unit	Irrigation	2,162
Huntley South Unit	Irrigation	5,142
Seven Mile—Sitting Bull Unit	Irrigation	10,449
LAND CONSERVATION		
Accelerated Land Conservation	a) State and private lands—431,000 acres b) National resource lands—13,500 acres c) Forest Service lands—2,400 acres	a) 18,304 b) 167 c) 991
Streambank Greenbelt Program	Streambank protection and wildlife habitat enhancement	Not Available
Rehabilitation of the Headwater Basin of the Shields River, Park Co.	Sediment control	Not available
FISH AND WILDLIFE		
Removal of fish spawning barriers to tributary streams, Park Co.	Improve salmonoid spawning passage	Total cost not determined
Flow regimen improvement of tributary streams above Livingston	Improvement of trout habitat	Not available
Antelope Creek Storage, Park Co.	Provision for instream flow in Shields River	9,606
Management of Yellowstone River islands to improve goose and wildlife habitat	Improve goose and wildlife habitat	Not available
Wheat Basin and Broadview Wildlife Refuges, Stillwater and Yellowstone Counties	Constant water supply for existing wildlife refuges while allowing for development of new refuges	Not available

Table 58, Continued
Recommended Plan Elements, Upper Yellowstone

Plan Function/Element	Purpose	Initial Cost ($1,000)
FISH AND WILDLIFE, Continued		
Classify the Beartooth and Absaroka Primitive Areas as a wilderness area	Maintain a unique natural area in its natural state	Not available
Instream Flows—Compare the reservation requests of the Departments of Fish and Game and Health and Environmental Sciences. Take the highest flow in each case.	Preservation of existing fish and wildlife habitat and water quality. Prevention of any further degradation.	Total cost not determined
OUTDOOR RECREATION		
Yellowstone River	Wild, scenic, and recreational river	38,547
Boulder River— Upside-Down Creek to confluence with Yellowstone River—58 miles	Wild, scenic, and recreational river	4,130
Shields River—Flathead Creek to confluence with the Yellowstone River—40 miles	Wild, scenic, and recreational river	6,568
Stillwater River—20 miles above U.S. Forest Service Woodbine Campground to confluence with the Yellowstone River—65 miles	Wild, scenic, and recreational river	4,964
MULTIPURPOSE		
Flathead Creek Project, SCS Gavin's Point Study, Gallatin/Park Counties	Irrigation, late season instream flows, and increase waterfowl habitat	3,089
Pryor Creek Project, SCS Wind/Bighorn Survey, Big Horn/Yellowstone Counties	Irrigation, trap sediment, improve wild fowl habitat, reduce bank erosion, and reduce wind erosion	3,497

Figure 15
Recommended Plan Elements, Upper Yellowstone



1. White Horse Bench Unit
2. Huntley South Unit
3. Seven Mile-Sitting Bull Unit
4. Rehabilitation of the Headwat , Basin of the Shields River, Park Co.
5. Removal of fish spawning barriers to tributary streams, Park Co.
6. Flow regimen improvement of tributary streams above Livingston
7. Antelope Creek Storage, Park Co.
8. Management of Yellowstone River islands to improve goose and wildlife habitat
9. Wheat Basin and Broadview Wildlife Refuges, Stillwater and Yellowstone Counties
10. Classify the Beartooth and Absaroka Primitive Areas as a wilderness area
11. Wild, scenic, and recreational river—Yellowstone River
12. Wild, scenic, and recreational river—Boulder River (Upside-Down Creek to confluence with Yellowstone River—58 miles)
13. Wild, scenic, and recreational river—Shields River (Flathead Creek to confluence with the Yellowstone River—40 miles)
14. Wild, scenic, and recreational river—Stillwater River (20 miles above U.S. Forest Service Woodbine Campground to confluence with the Yellowstone River—65 miles)
15. Flathead Creek Project, SCS Gavin's Point Study, Gallatin/Park Counties
16. Pryor Creek Project, SCS Wind/Bighorn Survey, Big Horn/Yellowstone Counties

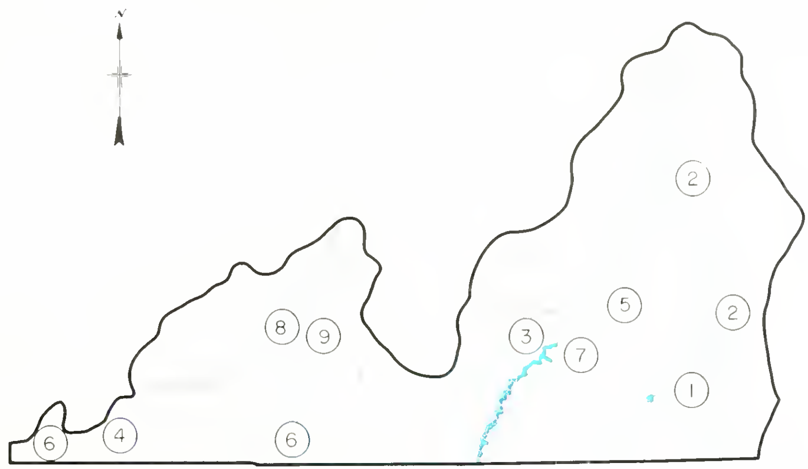
Plan elements which are not specifically located
- Accelerated Land Conservation
- Streambank Greenbelt Program
- Instream Flows—Compare the reservation requests of the Departments of Fish and Game and Health and Environmental Sciences Take the highest flow in each case

Table 59
Recommended Plan Elements, Clarks Fork-Bighorn

Plan Function/Element	Purpose	Initial Cost ($1,000)
AGRICULTURE		
Wyola-Lodge Grass Canal, SCS Wind/Bighorn Survey (Upper Little Bighorn River), Big Horn County	Irrigation	552
Long Otter and Gas Field Pumping Units, SCS Wind/Bighorn Survey (Lower Little Bighorn eastside), Big Horn County	Irrigation	455
Hardin Unit, USBR Pick-Sloan Missouri Basin Program, Big Horn County	Irrigation	66,731
LAND CONSERVATION		
Accelerated Land Conservation	a) State and private lands—385,000 acres b) National resource lands—25,500 acres c) Forest Service lands—0 acres	a) 9,296 b) 303 c) 0
Accelerated Land Conservation, Streambank Greenbelt Program	Fish and wildlife habitat and streambank erosion prevention	Not available
FISH AND WILDLIFE		
Instream Flows	Maintain streamflow	Not available
Classify the Beartooth and Absaroka Primitive Areas as a wilderness area	Maintain a unique natural area in its natural state	Not available

OUTDOOR RECREATION		
Bighorn River—below Bighorn National Recreation Area to Yellowstone River—50 miles	Wild, scenic, and recreational river	8,044
Clarks Fork River—Montana-Wyoming border to Yellowstone River—75 miles source to Montana border	Wild, scenic, and recreational river	11,946
HYDROELECTRIC POWER		
Yellowtail Afterbay Power Plant (hydropower—11MW) USBR, Big Horn County	Hydroelectric power	10,490
MULTIPURPOSE		
Elbow Creek Project, SCS Wind/Bighorn Survey, Carbon County	Irrigation and recreation	2,657
Blue Water-Five Mile Creek Project, SCS Wind/Bighorn Survey, Carbon County	Irrigation and recreation	2,751

Figure 16
Recommended Plan Elements, Clarks Fork-Bighorn



1. Wyola-Lodge Grass Canal, SCS Wind-Bighorn Survey (Upper Little Bighorn River), Big Horn County
2. Long Otter and Gas Field Pumping Units, SCS Wind-Bighorn Survey (Lower Little Bighorn Eastside), Big Horn County
3. Hardin Unit, USBR Pick-Sloan Missouri Basin Program, Big Horn County
4. Classify the Beartooth and Absaroka Primitive Areas as a wilderness area
5. Wild, scenic, and recreational river—Bighorn River—below Bighorn National Recreation Area to Yellowstone River (80 miles)
6. Wild, scenic, and recreational river—Clarks Fork River—Montana-Wyoming border to Yellowstone River (75 miles) and source to Montana-Wyoming border (10 miles)
7. Yellowtail Afterbay Power Plant (hydropower—11 MW) USBR, Big Horn County
8. Elbow Creek Project, SCS Wind-Bighorn Survey, Carbon County
9. Blue Water-Five Mile Creek Project, SCS Wind-Bighorn Survey, Carbon County

Plan elements which are not specifically located:
- Accelerated Land Conservation
- Streambank Greenbelt Program
- Instream Flows

Table 60
Recommended Plan Elements, Tongue-Powder

Plan Function/Element	Purpose	Initial Cost ($1,000)
ENERGY INDUSTRY		
Tongue River Power Plant—6 MW	Power Generation	a/
Recommended Energy Development	Coal production and conversion	1,560,000
LAND CONSERVATION		
Accelerated Land Conservation	a) State and private lands—639,000 acres b) National resource lands—78,000 acres c) Forest Service lands—4,300 acres	a) 7,653 b) 982 c) 1,119
Streambank Greenbelt Program	Fish and wildlife habitat as well as streambank erosion prevention	Not available
FLOOD CONTROL		
Miles City Levee, Corps of Engineers	Miles City flood protection	5,170
FISH AND WILDLIFE		
Instream Flows	Preservation of existing fish and wildlife habitat and water quality. Prevent any further degradation.	Not available
OUTDOOR RECREATION		
Tongue River—Tongue River Reservoir to Yellowstone River—115 miles	Wild, scenic, and recreational river	18,398
MULTIPURPOSE		
Tongue River Reservoir Modification—Tongue River Reservoir Modification Feasibility Study, Montana Department of Natural Resources and Conservation, Big Horn County	Irrigation, industrial water supply, and fish and wildlife	49,235

a/ Included in Tongue River Reservoir Modification

Figure 17
Recommended Plan Elements, Tongue-Powder

1. Tongue River Power Plant (6 MW)
2. Miles City Levee, Corps of Engineers Yellowstone Level B, Custer County
3. Wild, scenic, and recreational river—Tongue River, Tongue River Reservoir to Yellowstone River (115 miles)
4. Tongue River Reservoir Modification, Tongue River Reservoir Modification Feasibility Study, Montana Department of Natural Resources and Conservation, Big Horn County

Plan elements which are not specifically located.

Accelerated Land Conservation
Recommended Energy Development
Streambank Greenbelt Program
Instream Flows

Table 61
Recommended Plan Elements, Lower Yellowstone

Plan Function/Element	Purpose	Initial Cost ($1,000)
AGRICULTURE		
Conns Coulee Unit, USBR Single Purpose Irrigation, Study of Yellowstone River Basin, Prairie County	Irrigation	3,132
Fox Creek South Unit, USBR Single Purpose Irrigation, Study of the Yellowstone River Basin, Richland County	Irrigation	1,661
Hay Creek Unit, USBR Single Purpose Irrigaticn, Study of the Yellowstone River Basin, Treasure and Rosebud Counties	Irrigation	6,633
Forsyth Unit, USBR Single Purpose Irrigation, Study of the Yellowstone River Basin, Rosebud County	Irrigation	11,180
Fallon Bench Unit, USBR Single Purpose Irrigation, Study of the Yellowstone River Basin, Prairie County	Irrigation	14,430
Broadview Bench Unit, USBR Single Purpose Irrigation, Study of the Yellowstone River Basin, Prairie County	Irrigation	7,432
War Dance Unit, USBR Single Purpose Irrigation, Study of the Yellowstone River Basin	Irrigation	2,323
Seven Sisters Unit, USBR Pick-Sloan Missouri Basin Program, Richland County	Irrigation	4,428

Table 61, Continued
Recommended Plan Elements, Lower Yellowstone

Plan Function/Element	Purpose	Initial Cost ($1,000)
ENERGY INDUSTRY		
Recommended Energy Development	Coal production and conversion	1,153,000
LAND CONSERVATION		
Accelerated Land Conservation	a) State and private lands—1,551,000 acres b) National resource lands—251,500 acres c) Forest Service lands—700 acres	a) 33,728 b) 2,855 c) 87
Streambank Greenbelt Program	Add fish and wildlife habitat while helping to prevent streambank erosion	Not available
FISH AND WILDLIFE		
Instream Flows—Compare the reservation requests of the Departments of Fish and Game and Health and Environmental Sciences. Take the highest flow in each case.	Preservation of existing fish and wildlife habitat and water quality. Prevent any further degradation.	Not available
OUTDOOR RECREATION		
Lower Yellowstone from Pompeys Pillar to Montana-North Dakota border—260 miles	National scenic and recreation river	41,068
STREAMBANK EROSION		
Streambank Protection	Yellowstone River (Intake, Mont., to mouth)	5,600

Figure 18
Recommended Plan Elements, Lower Yellowstone

1. Conns Coulee Unit, Prairie County[1]
2. Fox Creek South Unit, Richland County[1]
3. Hay Creek Unit, Treasure and Rosebud Counties[1]
4. Forsyth Unit, Rosebud County[1]
5. Fallon Bench Unit, Prairie County[1]
6. Broadview Bench Unit, Prairie County[1]
7. War Dance Unit[1]
8. Seven Sisters Unit, Richland County[1]
9. National scenic and recreational river—Lower Yellowstone from Pompeys Pillar to Montana-North Dakota border (260 miles)
10. Streambank Protection, Yellowstone River, Intake, Montana to mouth

[1] USBR, Single Purpose Irrigation Study of the Yellowstone River Basin

Plan elements which are not specifically located
- Accelerated Land Conservation
- Streambank Greenbelt Program
- Instream Flows
- Energy Development

Table 62
Recommended Plan Elements, North Dakota Tributaries

Plan Function/Element	Purpose	Initial Cost ($1,000)
ENERGY INDUSTRY (COAL)		
Energy Development	Recommended energy development scenario	1,641,000
LAND CONSERVATION		
Accelerated Land Conservation	a) State and private lands—1,787,000 acres b) National resource lands—14,000 acres c) Forest Service lands—5,500 acres	a) 49,573 b) 140 c) 1,198
Preservation	Unique woodland areas	305
FLOOD CONTROL		
Flood Control	Hazen flood control	160
STREAMBANK EROSION		
Streambank Protection	Knife River historical site protection	105
Streambank Protection	Missouri River (Garrison Dam to Lake Oahe)	8,039
FISH AND WILDLIFE		
Instream Flow	Modified level of streamflow North Fork Grand River at Haley, 8,536 AF/year	Not available
Instream Flow	Cannonball River at Breien, 68,884 AF/year	
Instream Flow	Little Missouri River near Watford City, 186,326 AF/year	

Instream Flow	Knife River at Hazen, 62,238 AF/year	
Instream Flow	Heart River near Mandan, 70,628 AF/year	
OUTDOOR RECREATION		
Scenic and Recreation Rivers	Yellowstone River, Montana State line to Missouri River	3,264
Scenic and Recreation Rivers	Knife River, Manning, N. Dak., to Missouri River	12,142
Scenic and Recreation Rivers	Heart River, Heart Butte Dam to Missouri River	16,796
Scenic and Recreation Rivers	Cannonball River, Shields, N. Dak., to North Dakota bridge 1806	7,274
Scenic and Recreation Rivers	Missouri River, 11 miles downstream from Garrison Dam to mouth of Heart River at Ft. Lincoln State Park	11,806
HYDROELECTRIC POWER		
Hydroelectric Power	Additional hydropower at Garrison Dam (peaking)	90,748

Figure 19
Recommended Plan Elements, North Dakota Tributaries

1. Preservation, unique woodland areas
2. Flood Control, Hazen flood control
3. Streambank Protection, Knife River historical site protection
4. Streambank Protection
   a. Missouri River (Garrison to Lake Oahe)
   b. Yellowstone River (Intake, Mont., to mouth)
5. Instream Flow
   a. North Fork Grand River at Haley
   b. Cannonball River at Breien
   c. Little Missouri near Watford City
   d. Knife River at Hazen
   e. Heart River at Mandan
6. Scenic and recreation rivers
   a. Yellowstone River, Montana State line to Missouri River
   b. Knife River, Manning to the Missouri River
   c. Heart River, Heart Butte Dam to the Missouri River
   d. Cannonball River, Shields to North Dakota bridge 1806
   e. Missouri River, 11 miles downstream of Garrison Dam to mouth of Heart River and Fort Lincoln State Park
7. Hydroelectric Power, additional hydropower at Garrison Dam for peaking

Plan elements which are not specifically located
   Energy Development
   Accelerated Land Conservation

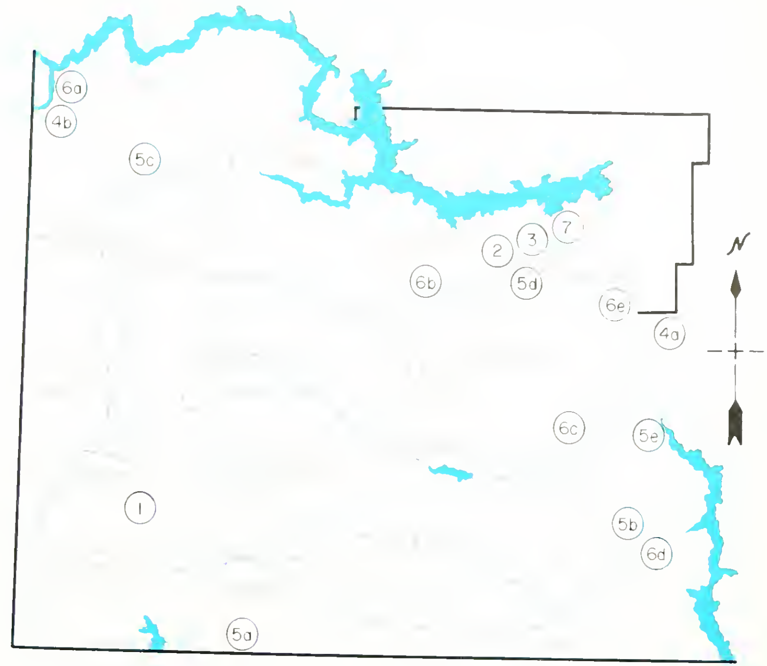


Table 63
Recommended Plan Elements, Wind-Bighorn-Clarks Fork

Plan Function/Element	Purpose	Initial Cost ($1,000)
AGRICULTURE		
Hidden Valley Project	Irrigation	325
Kirby Draw Project	Irrigation	13,580
Muddy Ridge Area	Irrigation	13,000
Taylor-Dutch Flats Project	Irrigation	169
Banjo Flats Project	Irrigation	12,963
Crooked Creek Project	Irrigation	317
Greybull Flat Unit	Irrigation	887
Lakeview Canal Rehabilitation	Irrigation	1,248
Lateral H-103 Improvement	Irrigation	600
Lateral R-9N Improvement	Irrigation	333
Sage Creek-Pryor Mountain Project	Irrigation	1,362
Lower Shell Creek Project	Irrigation	738
Shoshone Extensions Unit-North (Polecat Bench)	Irrigation	52,000
Shoshone Extensions Unit-South	Irrigation	42,366
Shoshone Extensions Unit-(South Addition) Sage Section	Irrigation	938
Shoshone Extensions Unit-(South Addition) McCullough Section	Irrigation	746
Sidon Canal Rehabilitation	Irrigation	2,640
Westside Irrigation Project	Irrigation	19,207
Badger Basin Unit	Irrigation	1,968

Table 63, Continued
Recommended Plan Elements, Wind-Bighorn-Clarks Fork

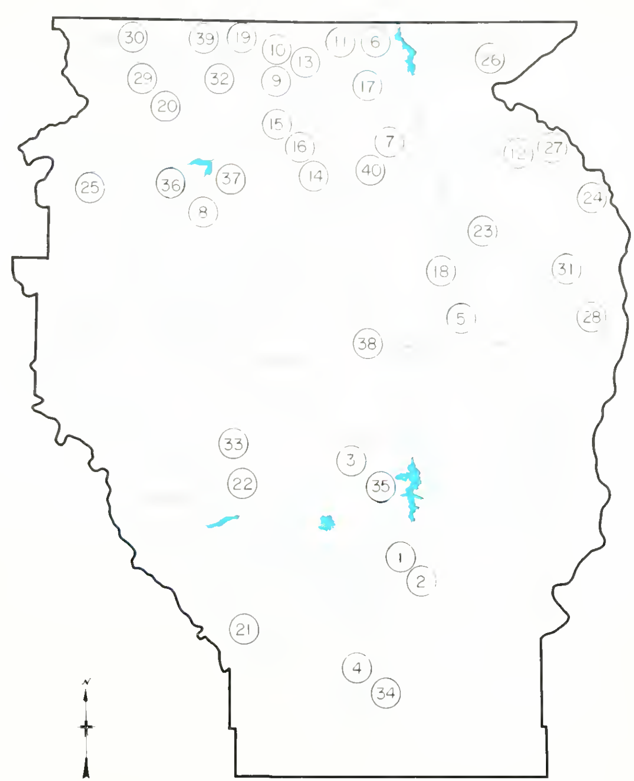
Plan Function/Element	Purpose	Initial Cost ($1,000)
LAND CONSERVATION		
Sunlight-Crandall Basins	Establish development control programs	6,000
Accelerated Land Conservation	a) State and private lands—1,432,000 acres b) National resource lands—556,000 acres c) Forest Service lands—5,540 acres	a) 25,915 b) 6,660 c) 3,959
OUTDOOR RECREATION		
Popo Agie River Recreation	Scenic and recreational river	60
Wind River Recreation source to Boysen Reservoir	Wild, scenic, or recreational river	17,716
Bighorn River, Wyoming Component 1—Wind-Bighorn River-Boysen Dam to north end of Wind River Canyon—12 miles	Recreation	1,624
Cloud Peak Primitive Area	Designate as wilderness area	Not available
North Fork Shoshone River, Component 1—North Absaroka wilderness boundary to eastern national forest boundary—26 miles	Scenic and recreational river	372
Component 2—national forest—boundary to Buffalo Bill Reservoir—10 miles	Recreational river	1,756
Porcupine Creek—Devil Canyon (Wyoming)—source to Montana border - 22 miles	Scenic and recreational river	274
Shell Creek (Wyoming)—recreation—source to Bighorn National Forest boundary—26 miles	Scenic or recreational river	60
Tensleep—West Tensleep Lake[a/] to Tensleep, Wyo.—23 miles	Scenic and recreational river	1,202

Clarks Fork River Recreation[b/], Component 1—Wyoming border to Crandall Creek Bridge—20 miles	Recreational river	524
Component 2—Crandall Creek[b/] to mouth of canyon—22 miles	National wild and scenic river	372
Component 3—mouth of Clarks Fork[c/] canyon to Montana State line—20 miles	Maintain present ownership and use	2,124
High Country Lakes	Designate Beartooth area north of U.S. Highway 212 as wilderness area	Not available
MULTIPURPOSE		
Nowood River Project	Irrigation, flood protection, recreation	1,018
Off-Stream Storage, Clarks Fork Basin	Irrigation, wildlife, fish	5,535
Crow Creek Project	Irrigation, flood control	1,213
Upper Beaver Creek Project	Irrigation, flood control, sediment control, and other purposes	1,500
Sand Mesa Project	Wildlife habitat, irrigation	1,429
Buffalo Bill Enlargement	Multipurpose	42,553
Cody Canal Rehabilitation	Irrigation and other purposes	3,068
Gooseberry Creek Project	Irrigation and other purposes	1,123
Cyclone Bar Project	Irrigation, flood control, and sediment control	285
OTHER		
Lower Greybull River	Drainage	5,266

a/ Designation under Wild and Scenic Rivers Act
b/ Administrative designation by USFA
c/ State designation

Figure 20
Recommended Plan Elements, Wind-Bighorn-Clarks Fork

1. Hidden Valley Project
2. Kirby Draw Project
3. Muddy Ridge Project
4. Taylor-Dutch Flats Project
5. Banjo Flats Project
6. Crooked Creek Project
7. Greybull Flat Unit
8. Lakeview Canal Rehabilitation
9. Lateral H-103 Improvement
10. Lateral R-9N Improvement
11. Sage Creek-Pryor Mountain Project
12. Lower Shell Creek Project
13. Shoshone Extensions Unit-North (Polecat Bench)
14. Shoshone Extensions Unit-South
15. Shoshone Extensions Unit-(South Addition) Sage Section
16. Shoshone Extensions Unit-(South Addition) McCullough Section
17. Sidon Canal Rehabilitation
18. Westside Irrigation Project
19. Badger Basin Unit
20. Sunlight-Crandall Basins
21. Popo Agie River Recreation
22. Wind River Recreation, source to Boysen Reservoir
23. Bighorn River, Wyoming Component 1—Wind-Bighorn River—Boysen Dam to north end of Wind River Canyon
24. Cloud Peak Primitive Area
25. North Fork Shoshone River
    Component 1—North Absaroka Wilderness boundary to eastern national forest boundary
    Component 2—National forest boundary to Buffalo Bill Reservoir
26. Porcupine Creek—Devil Canyon (Wyoming)—source to Montana border
27. Shell Creek (Wyoming) Recreation, source to Bighorn National Forest boundary
28. Tensleep-West Tensleep Lake to Tensleep, Wyo.
29. Clarks Fork River Recreation
    Component 1—Wyoming border to Crandall Creek bridge
    Component 2—Crandall Creek to mouth of canyon
    Component 3—mouth of Clarks Fork Canyon to Montana State line
30. High Country Lakes
31. Nowood River Project
32. Off-Stream Storage Clarks-Fork Basin
33. Crow Creek Project
34. Upper Beaver Creek Project
35. Sand Mesa Project
36. Buffalo Bill Enlargement
37. Cody Canal Rehabilitation
38. Gooseberry Creek Project
39. Cyclone Bar Project
40. Lower Greybull River



Plan elements which are not specifically located:
Accelerated Land Conservation

Table 64
Recommended Plan Elements, Northeast Wyoming

Plan Function/Element	Purpose	Initial Cost ($1,000)
ENERGY INDUSTRY		
Energy Conservation	Coal production and conservation	Not available
Energy Development	Coal production and conservation	1,692,000
LAND CONSERVATION		
Accelerated Land Conservation	a) State and private lands—5,472,000 acres	a) 32,427
	b) National resource lands—217,000 acres	b) 2,562
	c) Forest Service lands—110,100 acres	c) 2,009
FLOOD CONTROL		
Sheridan Flood Control (Stage III)	Flood control	894
OUTDOOR RECREATION		
South Tongue River Recreation[a/] (including the east and west forks) —source to Tongue River excluding a small reservoir above Shutts Flats—27 miles	Scenic or recreational river	0
Tongue River Recreation[b/] —Component 1—source to national forest boundary—26 miles	Scenic or recreational river	216

a/ Administrative designation by USFS
b/ Designation under the Wild and Scenic Rivers Act

Table 64, Continued
Recommended Plan Elements, Northeast Wyoming

Plan Function/Element	Purpose	Initial Cost ($1,000)
OUTDOOR RECREATION, Con't.		
Component 2—national forest[c/] —boundary to Montana-Wyoming border —35 miles	Recreation river	1,829
MULTIPURPOSE		
South Tongue Watershed	Irrigation, recreation	4,787
Kaycee Project	Irrigation, M&I water	26,500
Middle Fork Crazy Woman Project	Irrigation water storage, recreation, flood control	2,180
Northeast Wyoming Water Project	Water supply for agriculture, industry, recreation, fish and wildlife, other functions	(Stage 1) 31,745 (Stage 2) 42,852 (Stage 3) 88,415
Cabin Creek Project	Irrigation, flood control	397

c/ State designation

Figure 21
Recommended Plan Elements, Northeast Wyoming

1 Sheridan Flood Control (Stage III)
2 South Tongue River Recreation (including the east and west forks)—source to Tongue River excluding a small reservoir above Shutts Flats
3 Tongue River Recreation
Component 1—source to national forest boundary
Component 2—national forest boundary to Montana-Wyoming border
4 South Tongue Watershed
5 Kaycee Project
6 Middle Fork Crazy Woman Project
7 Northeast Wyoming Water Project
8 Cabin Creek Project

Plan elements which are not specifically located
Energy Conservation
Energy Development
Accelerated Land Conservation

CHAPTER 8

IMPACT OF RECOMMENDED PLAN

This chapter summarizes and compares the alternative plans for NED, EQ, SRD, and RP in terms of each plan's response to meeting the needs of the seven individual planning areas and the study area as a whole, and in terms of beneficial and adverse effects. The effects are quantified where practicable, but for some, only a qualitative observation is made. While the evaluations are preliminary in most instances, they are useful in comparing what can be anticipated from each of the alternative plans.

The Yellowstone level B study provided an opportunity for private and public groups operating at the local, State, and national levels to assemble information available to them and coordinate their activities in the area of resource planning. The study participants intend that the results of their efforts be used in determining what resource-related activities and developments should move forward to implementation. The information contained in descriptions of beneficial and adverse effects of plan elements in the environmental quality account of the displays in chapter 6 provides an assessment of environmental effects as do the tables displaying and comparing the plan in this chapter.

This report does not require any substantive Federal, State, or local action. Under these circumstances, the management group consensus as expressed at its June 16, 1977, meeting, was that a formal environmental impact statement (EIS) was neither required nor desirable at this

stage, recognizing that such statements will be needed when individual program items or groups of items are moved into the preconstruction and implementation stages. These later EIS's would be needed irrespective of whether an EIS had been prepared to accompany the Yellowstone level B report.

A part of the management group decision related to the reconnaissance nature of much of the material utilized in planning. Selecting alternative potentials for further study and for coordinating planning activities is a legitimate and very useful process at the reconnaissance level. Trying to use reconnaissance data as a basis for the precise evaluations expected of a formal EIS is quite a different matter. Any attempt to do so would involve a considerable expenditure of resources to produce a product that at worst could be misleading, at best would add little of substance to the evaluations contained in the following paragraphs and the supporting planning area documents, and that in any case would of necessity have to be redone when more detailed plans are developed.

Assessment of Plans' Capability to Meet Needs

While there is no particular mandate that *opportunities* cannot be included, the primary focus and justification of recommended plan components is that their capabilities and values are in response to and fall within the limits of identified needs. However, in responding to these needs and also to the objectives for the study area as a whole, it is obvious that a deficiency or excess in one or more of the seven planning areas may be countered by opposite results in the other areas. Table 65 shows a summary of the plan capability or responses to identified needs for the study area. The recommended plan column in tables 67, 69, 71, 73, 75, 77, and 79 shows the aggregate remaining corresponding information for seven planning areas for need or excess in response taking both the SRD and NED/EQ capabilities into account. Residual needs or excess capability are shown for individual planning areas but seldom is an excess capability shown for the entire study area.

Comparison of Alternative Plan Effects

The recommended plan presented in chapter 7 reflects selections from the NED and EQ plans which could qualify for national assistance or accomplishment. Shown also are selections from the SRD, which based on the criteria outlined in chapter 6, could be implemented only where there is a non-Federal source of financing. Under the NED and EQ plans, and for the NED account, all monetary figures for benefits represent only direct user values, whereas the SRD figures in the recommended plan account also include the effects of increased community income, improved services, induced and stemming from business activity, to serve the direct user beneficiaries, and other such factors. To the extent that recommended SRD and NED/EQ components are implemented, the results will add together in fulfilling needs.

Table 65 shows the beneficial and adverse effects for the study area, for the NED, EQ, and SRD plans together with the recommended plan. This separates the evaluation of effects under each of the four accounts: (1) national economic development; (2) environmental quality; (3) regional development; and (4) social well-being. Tables 68, 70, 72, 74, 76, 78, and 80 present similar information for the seven planning areas. In those tables the recommended plan elements are broken into columns, SRD and NED/EQ. These columns identify the alternative plan from which the recommended plan elements were taken. The additional income to residents shown under the regional development accounts of tables 68, 70, 72, 74, 76, 78, and 80, refers to net income increases due to new full-time jobs associated with the particular plan component. Those increased incomes were multiplied by multipliers and summed to provide an estimate of increased annual income shown under item A of the social well-being account. There are shown in columns 6 and 8 for each beneficial or adverse effect the plus (+) or minus (-) difference of the recommended plan and the comparable components of the NED and EQ alternative plans in column (4). For SRD, there are shown only the results for all programs meeting this criteria in column (9), and for those selected therefrom and recommended as set forth in column (2).

Most components in SRD failed to meet the NED test. A few did meet the EQ test and these appear in both the EQ plan and SRD program. There are components that qualified for the NED plan, but are included in and are also recommended for State regional implementation. In no case does a given component appear in both the SRD and NRD EQ entries of columns (2) and (3).

Energy development (coal) will in many respects be regulated by government, but will develop privately; however, it does impact the study area's resources in many respects. In view of this, the most important effects have been evaluated and displayed as parenthesized entries and are not included in the tables, as noted.

Land Use Impacts

The most significant land use impacts associated with the recommended plan are the shifts of rangeland to other uses, primarily to irrigation status, industrial uses, (coal), water areas, and recreation/wildlife. The multiple effects are evident in table 66 for the study area as a whole, and major types are summarized in table 81. These shifts would not necessarily result in reductions to the amount of livestock grazed, but do indicate possible future changes in feed utilization and the length of time that livestock must rely on winter feed. Tables 16 and 17 provide forecasts of required production for meat and for livestock feed.

Table 65 reflects a potential to provide some 52,600 acres of cropland with supplemental irrigation water. In addition to other private development, the plan contemplates some 243,000 acres of added public irrigation development.

Nearly 19,500 new surface water acres would be created with a conversion from agricultural land and terrestiral habitat to aquatic uses. Nearly 300,000 acres could be involved in easements for scenic and recreation uses at selected locations along some 1,630 miles of river. About 1,740 acres of forest and woodland or stream bottoms would be converted to developed recreation areas. Preservation of woodlands and unique areas together with preservation or improvement of wildlife habitat could involve over 1 million acres, much of this already having some public designation, such as the 913,500 acres in the Absaroka and Beartooth Primitive Areas as recommended for a "Beartooth Wilderness Area."

Table 65. Alternate Plan Capability — Yellowstone Study Area

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit. Year 2000	Remaining Need Or Opportunity	Recommended Plan: Provided SRD	Recommended Plan: Provided NED/EQ	Recommended Plan: Remaining Need	Alternative Plan Responses: NED Provides	NED Remaining	EQ Provides	EQ Remaining	SRD All Programs
Agriculture (Irrigation)												
a Low (3E)	Ac	1,660,215	1,171,750	488,465		(52,601)[7]	245,238	(72,671)[7]	320,336	0	498 465	(15,400)[7]
b High (3E')	Ac	1,946,995	1,171,750	775 245	143,355[8]	99,872[8]	532,018	178,129[8]	597,116	0	775,245	229,325
c Livestock (Beef, Hogs, Sheep)	M feed units E'	19,516	17,327	2,189	852	1,235	102	1,292	897	0	2 189	1 258
d Livestock Produced (Beef, Hogs, Sheep)	MM lbs E'	1,570	1,332	238	64	113	61	113	125	0	238	92
Municipal, Rural Domestic,	Ac-ft	304,800	244 800	(60,000)[2]	15,000[1]	0	45,000	60,000	0	0	60,000	15,000
and Livestock Water	Consumed			(15,000)[2]	(15,000)[2]							
Nonenergy Industrial Water	AF Consumed	20,552	20,552	0	0	0	0	0	0	0	0	0
Energy Industry (Coal)												
a Coal Production — Low	M tons	111,000										
Coal Production — Most Probable	M tons	513,120										
Coal Production — High	M tons	791,830	635,730	(156,100)	0	(513,470)	(278,360)	(747,350)	(44,480)	(226,000)	(565,830)	0
b Thermal Elec Capacity — Low	Megawatts	2,562										
Thermal Elec Capacity — M Probable	Megawatts	10,992										
Thermal Elec Capacity — High	Megawatts	10,213	13,613	(3,400)	0	(8,574)	(1,639)	(13,613)	(3 400)	(5,839)	(4,374)	0
c Thermal Elec Production — Low	Gigawatts/hrs/yr	15,711										
Thermal Elec Production — M Probable	Gigawatts/hrs/yr	51,318										
Thermal Elec Production — High	Gigawatts/hrs/yr	48,878	68,124	(19,246)	0	(50,828)	(1,950)	(68,124)	(19,246)	(39,969)	(8,909)	0
d Syngas Production — Low	MC fd	0										
Syngas Production — M Prob	MC fd	3,814										
Syngas Production — High	MC fd	5,354	3,854	(1,500)	0	(250)	(5,104)	0	(5,354)	0	(5,354)	0
e Water Consumed — Low	Ac-ft	46,702										
Water Consumed — M Prob	Ac-ft	327,413										
Water Consumed — High	Ac-ft	536,032	438,606	(97,426)	0	(260,269)	(275,763)	(471,434)	(64,598)	(113,739)	(422,293)	0
f Export-Rail/Slurry — High	M tons	553,000	305,600	(247,400)	0	(454,140)	(98,860)	(703,180)	(150,180)	(196,170)	(356,830)	0
Land Conservation Measures												
a Area Requiring Treatment	M Ac	37,176	11,336	25,840	0	(12,980)	12,860	12,980	12,860	(18,669)	7,171	0
b. Capitalized Cost	M Dollars	624,547	232,760	391,787	0	(200,868)	190,919	200,868	190,919	235,858	155,919	0
Flood Control												
a Area Affected	M Ac	1,143	0	1,143	22	27	1,094	204	939	0	1,143	0
b Damage	M Dollars	12,851	0	12,851	255	448	12,148	1,700	11,151	0	12,851	0
Streambank Erosion												
a Affected	Bank miles	7,108	0	7,108	0	24	7,084	23	7,085	1	7,107	0
b Damage	M Dollars	2,496	0	2,496	0	115	2,381	10	2,486	105	2,391	0

[1] Partially supplied by proposals herein from ground water source
[2] See Municipal/Industrial water supply — this table
[7] Supplemental water supply
[8] Full water supply

Table 65. Alternate Plan Capability — Yellowstone Study Area

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit. Year 2000	Remaining Need Or Opportunity	Recommended Plan: Provided SRD	Recommended Plan: Provided NED/EO	Recommended Plan: Remaining Need	Alternative Plan Responses: NED Provides	NED Remaining	EQ Provides	EQ Remaining	SRD All Programs
Fish and Wildlife												
a Stream Fishing	Miles Lost to Reservoirs	—	—	—	13	19	—	104	—	2	—	54
b Lake Fishing (flat water)	M Acres			NA	9,110	3,567	NA	24,565	NA	1,210	NA	9,535
c Habitat Protected	M Acres	NA	NA	NA	0	78,553	NA	16,500	NA	80,973	NA	0
d Habitat Developed	M Acres	NA	NA	NA	0	1,810	NA	2,850	NA	1,360	NA	0
e Fishing	Days	2,812,053[6]	2,091,926[6]	720,127[6]	41,700	325,700	352,727	427,100	293,027	66,000	654,127	41,700
Outdoor Recreation												
a Land Area	Acres	5,607	0	5,607	810	942	3,855	772	4,635	1,546	4,061	542
b Water Area	Acres	17,412	0	17,412	14,301	5,194	2,083	48,985	31,573	1,982	15,430	25,795
c Wild, Scenic, Recr'n Rivers	Miles	1,739	0	1,739	632	998	109	484	1,255	1,739	0	632
d Recreation	Days	4,008,000	0	4,008,000	1,205,900	2,201,980	600,120	1,935,700	2,072,300	2,919,280	1,088,720	1,205,900
Water Quality Control and Instream Flow												
a Point Sources	W Q Standards				Assume compliance with "Water Quality Standards" by 1985							
b Nonpoint Sources	W Q Standards				Assume continued effort but longer term attainment of goals							
Instream Flows	State Program				Seek adequate legislation, reservations, and adequate administration							
Hydroelectric Power												
a Electric Generating Capacity	Megawatts	309	0	309	6	303	0	309	0	0	309	6
b Electric Generation	Gigawatts/hrs/yr	162	0	162	21	141	0	162	0	0	162	21
Municipal Industrial Water Supply	Acre Feet		—	60,000	15,000	0	45,000	60,000	0	0	60,000	15,000

[6] Figures do not include those for North Dakota Tributaries Planning Area which were not available

NA — Not available

Table 66. Comparison of Alternative Plans — Yellowstone Study Area

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Thousand Dollars)							
1. NATIONAL ECONOMIC DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS[1]								
A Value of Increased Outputs/Goods/Services, and Value of Resources								
(1) Multipurpose[2]								
Total Cost	288,264	18 302	306,566	480,304	173,738	1,353	305,213	308,579
Annual Cost	25,793	1,346	27,139	39,990	+12,651	91	27 048	26,716
Annual Benefits	31,823	2,069	33,892	54 663	+20,771	93	33,799	35,814
(2) Agriculture (Irrigation)								
Total Cost	231,797	137,315	369,112	246,903	122,209	0	369 112	470,700
Annual Cost	17,808	9 668	27,476	17 860	9 616	0	27 476	35,250
Annual Benefits	15,912	13,576	29,488	23,430	6,058	0	29,488	25,298
(3) Energy Industry (Coal)[3]								
Total Cost	0	(6,046,000)	(6,046,000)	(7,930,300)	+(1,884,300)	(2 277,500)	(3,768,500)	0
Annual Cost	0	(1,930,820)	(1,930,820)	(2,274,820)	+(344,000)	(972,637)	(958,183)	0
Annual Benefits	0	(2,199 200)	(2 199,200)	(2,675,030)	+(475,830)	(1,014 320)	(1,184,880)	0
(4) Land Conservation Measures (Acceleration)								
Total Cost	0	200,868	200,868	200,868	0	235,858	+34 990	0
Annual Cost	0	16,197	16,197	16,197	0	17 799	+1,602	0
Annual Benefits	0	16,197	16,197	16,197	0	17,799	+1,602	0
(5) Flood Control								
Total Cost	2,087	7,298	9,385	15,862	+9 280	0	6 582	4 302
Annual Cost	273	511	784	1,257	+666	0	591	426
Annual Benefits	246	658	904	1,700	+1,006	0	694	367
(6) Streambank Erosion								
Total Cost	0	12,860	12,860	0	12,860	105	12,755	0
Annual Cost	0	975	975	0	975	7	968	0
Annual Benefits	0	NA	NA	0	NA	0	NA	0
(7) Fish and Wildlife								
Total Cost	3,099	10,048	13,147	4 708	8,439	14 872	+1,725	3,099
Annual Cost	349	652	1,001	414	587	1,090	+89	349
Annual Benefits	287	28	315	494	+179	119	196	287
(8) Outdoor Recreation								
Total Cost	92,643	135,711	228,354	61,578	166,776	237,784	+9 430	89,206
Annual Cost	8,572	11,868	20,440	5,791	14,649	20,396	44	8,431
Annual Benefits	3,904	11,117	15,021	6,999	-8,022	14,663	358	3,857
(9) Hydroelectric Power								
Total Cost	20,679	101,238	121,917	121,917	0	0	121,917	20,679
Annual Cost	1,469	6,821	8,290	8,290	0	0	8,290	1,469
Annual Benefits	1,663	10,732	12,395	12,395	0	0	12,395	1,663
(10) Municipal/Industrial Water Supply								
Total Cost	217,738	0	217,738	348,007	+130,269	11,884[4]	-205,854	237,058
Annual Cost	19,515	0	19,515	30,316	+10,801	782[4]	18,733	20,410
Annual Benefits	22,994	0	22,994	42,465	+19,471	0[4]	-22,994	26,861
(11) Total Plan								
Total Cost	568,043	605,986	4,029	999,843	170,735	500,503	670,075	825,044
Annual Cost	47,986	4,669	678	80,125	14,360	40,074	54,411	66,335
Annual Benefits	45,006	52,308	314	103,680	+6,576	32,581	64,523	58,333

[1] NED, EQ, and SRD "Annual Benefits" are "Direct" only. SRD includes other benefits in R D Account only
[2] Costs and benefits allocated to respective functions
[3] Energy Industry figures ( ) are not included in "Total Plan"
[4] Environmental protection dikes at Buffalo Bill Reservoir, $11,884,000

Table 66. Comparison of Alternative Plans — Yellowstone Study Area

Account and Component	Recommended Plan (RP) Provided: SRD	Recommended Plan (RP) Provided: NED/EQ	Total	National Economic Development Plan (NED): Provided	National Economic Development Plan (NED): (5) vs. (4)	Environmental Quality Plan (EQ): Provided	Environmental Quality Plan (EQ): (7) vs (4)	State-Regional Development (SRD): All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Thousand Dollars)							
2. ENVIRONMENTAL QUALITY, BENEFICIAL AND ADVERSE EFFECTS								
A Open/Green Spaces, Wild/Scenic/Recreational Rivers, Lakes, and Areas of Natural Beauty								
(1) Create Lakes (surface acres)	14,301	5,194	19,495	48,985	+29,490	1,982	17,513	25,795
(2) Develop Greenbelts (X)	X	588X	588X	X	588	588	0	0
(3) Convert Agricultural/Other Lands to Wildlife Refuge (acres)	546	302	848	546	−302	302	546	848
(4) Land Conversion to Recreation Areas (acres)	800	942	1,742	475	1,267	1,610	132	800
(5) Wild/Scenic/Recreation Rivers (miles)	632	998	1,630	484	1 146	1,739	+109	632
(6) Wild/Scenic/Recreation Rivers (easement acres)	116,381	182,511	298,892	74,140	224,752	322,872	+23,980	116 381
B Archaeological, Historical, Biological, and Geologic Resources, Selected Ecological Systems								
(1) Preserve Woodlands* (acres)	0	75,200	75,200	299	74,901	74 901	299	0
(2) Preserve Unique Areas (acres)	0	1,011,700	1,011,700	0	1,011,700	1,011,700	0	[illegible]
(3) Preserve/Add Wildlife Habitat (acres)	302	0	302	942	+640	302	0	302
(4) Improve Wildlife Habitat (acres)	0	265	265	265	0	170	95	[illegible]
(5) Lose Stream Fishery (miles)	13	19	32	104	+72	2	30	51
(6) Add Lake/Reservoir Fishery (acres)	9,110	3,567	12,677	24,565	+11,888	1,210	11 467	9 535
(7) Adopt Adequate Instream Flow Levels (X)	Areawide	Areawide[5]	X	0	Areawide[5]	Areawide[5]	0	Areawide[5]
C Quality of Water, Air, and Land Resources								
(1) Accelerated Land Treatment (M acres)	0	12,980	12 980	12,980	0	18,669	+5,[illegible]	[illegible]
(2) Reduction of Soil Loss/Sediment Yield/Nutrients (X)	0	X	X	X	0	X	[illegible]	[illegible]
(3) Improve Water Quality by Low Streamflow Augmentation (miles)	192	X	192X	192	0	0	192	192
(4) Area Affected by Strip Mining (average — M acres/year)	0	6,840	6,840	13,288	+6,448	4 768	2 07[illegible]	[illegible]
(5) Streamflow Degradation — Chemical Content of Return Flows (X)	X	X	X	X	0	0	X	X
(6) Air Pollutant Emissions — Particulates (tons/year)	0	27,545	27,545	34,059	+6,514	17 038	10 507	[illegible]
(7) Air Pollutant Emissions — Sulfur Oxides (tons/year)	0	328,363	328,363	408,702	+80,339	204 475	123 888	[illegible]
(8) Air Pollutant Emissions — Nitrogen Oxides (tons/year)	0	423,076	423,076	340,583	82,493	170 394	252 682	[illegible]
D Irreversible Commitment of Resources to Future Uses								
(1) Conversion of Agricultural Land, Terrestrial Habitat, etc., to Reservoirs (acres)	14,301	5,194	19,495	48 985	+29 490	1 982	17 513	[illegible] 795
(2) Conversion — Agricultural Land to Energy Plant Sites (acres)	0	26,477	26,477	33,453	+6 976	12 824	13 653	[illegible]
(3) Streamflow Depletion — Added Irrigation (ac-ft)	288,850	265,153	554,003	424,003	130,000	2 23[illegible]	551 768	442 [illegible]
(4) Streamflow Depletion — Added Energy Industry — Coal (ac-ft)	36,275	140,949	177,224	218,841	+41 617	98 190	79 034	[illegible] 27[illegible]
(5) Streamflow Depletion — Slurry Line Transport of Coal (ac-ft)	31,256	16,800	48,056	217,604	+169,548	0	48 056	31 [illegible]56
(6) Streamflow Depletion — Municipal/Industrial Water Supply (ac-ft)	34,390	4 360[6]	38,750[5]	172,250	+133,500	8,000[6]	30 750[5]	34 39[illegible]

[5] Also remove fish spawning barriers on three tributaries (Upper Yellowstone)
[6] Includes 4 000 acre-feet streamflow depletion for fish/wildlife stream augmentation
*Exclusive of the Yellowstone River Islands from Billings to Fairview (144,000 acres)

Table 66. Comparison of Alterantive Plans — Yellowstone Study Area

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (ED)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. REGIONAL DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS	(Thousand Dollars)							
A Value to Users of Increased Goods/Services — Study Area Residents								
(1) Agriculture (Irrigation)	32,232	13,576	45,808	23,430	22,378	0	45,808	62,533
(2) Energy Industry — Coal	0	(2,199,200)	(2,199,200)	(2,675,030)	+(475,830)	(1,014,320)	-(1,184,880)	0
(3) Land Conservation Measures — Accelerated	0	16,197	16,197	16,197	0	17,799	+1,602	0
(4) Flood Control . . .	255	448	703	1,700	+997	0	-703	434
(5) Streambank Erosion	0	NA	NA	0	NA	0	0	0
(6) Fish and Wildlife	390	28	418	494	+76	119	-299	464
(7) Outdoor Recreation	6,343	11,117	17,460	6,999	-10,461	14,663	-2,797	5,940
(8) Hydroelectric Power	2,846	10,732	13,553	12,395	-1,183	0	-13,553	2,846
(9) Municipal/Industrial Water Supply	31,179	0	31,179	42,465	+11,286	0	-31,179	38,134
(10) Total Plan	73,245	52,098	125,318	103,680	21,663	32,581	-92,737	110,351
B Additional Income Accruing to Residents								
(1) Agriculture (Irrigation)	15,195	12,240	27,435	18,150	-9,285	0	-27,435	30,450
(2) Energy Industry — Coal	0	(189,250)	(189,250)	(258,220)	+(68,970)	(71,025)	-(118,225)	0
(3) Land Conservaton Measures — Accelerated	0	47,465	47,465	47,465	0	56,315	+8,850	0
(4) Flood Control	30	128	158	248	+90	0	-158	30
(5) Fish and Wildlife	45	195	240	340	+100	270	+30	45
(6) Outdoor Recreation	1,200	1,525	2,725	1,260	-1,465	2,720	-5	1,200
(7) Hydroelectric Power	990	1,260	2,250	2,250	0	0	-2,250	990
(8) Municipal/Industrial Water Supply	630	0	630	810	+180	45	585	690
(9) Total Plan	18,090	62,813	80,903	70,523	-10,380	59,350	-21,553	33,405
C Net Beneficial Employment — Number of Jobs — Permanent Direct	(Units As Shown)							
(1) Agriculture (Irrigation)	1,013	818	1,831	1,438	393	0	-1,831	1,986
(2) Energy Industry — Coal	0	(12,617)	(12,617)	(17,215)	+(4,598)	(4,735)	-(7,882)	0
(3) Land Conservation	0	3,207	3,207	3,207	0	3,797	+590	0
(4) Flood Control	2	9	11	15	+4	0	-11	2
(5) Fish and Wildlife	3	13	16	22	+6	18	+2	3
(6) Outdoor Recreation	60	77	137	62	-75	136	-1	60
(7) Hydroelectric Power	33	42	75	75	0	0	-75	33
(8) Municipal/Industrial Water Supply	42	0	42	59	+17	3	-39	46
(9) Total .	1,153	4,166	5,319	4,878	441	3,954	1,365	2,130
D Regional Economic Base and Stability — To Year 2000								
(1) Convert Dry Land to Irrigated Agriculture (acres)	143,355	99,872	243,227	178,129	-65,098	0	-243,227	229,325
(2) Improve Irrigation Systems (acres)	1,700	38,752	40,452	38,752	-1,700	0	-40,452	1,700
(3) Provide Supplemental Irrigation Water Supply (acres)	6,200	46,401	52,601	72,671	+20,070	0	-52,601	15,400
(4) Provide Municipal/Industrial Water (ac-ft)	48,750	0	48,750	186,250	+137,500	0	-48,750	48,750
(5) Provide Coal for Regional/National Needs								
(a) Transport By Rail (M tons/year)	0	367,140	367,140	468,180	+101,040	181,170	-185,970	0
(b) Transport by Slurry Pipeline (M tons/year)	0	87,000	87,000	235,000	+148,000	15,000	-72,000	0
(c) Convert to Electricity in Study Area (M tons/year)	0	37,330	37,330	44,170	+6,840	29,830	-7,500	0
(d) Convert to Gas in Study Area (M tons/year)	0	22,000	22,000	0	-22,000	0	-22,000	0

Table 66. Comparison of Alternative Plans — Yellowstone Study Area

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
(6) Provide Energy Industry Water Supply								
(a) Mines and Land Reclamation (ac-ft/yr)	0	36,888	36,888	55,282	+ 18,394	+ 14,849	22,039	0
(b) Coal Gasification (ac-ft/yr)	0	20,000	20,000	0	20,000	0	20,000	0
(c) Electric Generation (ac-ft/yr)	0	125,325	125,325	168,549	+ 43,224	83,890	41,435	0
(d) Slurry Pipeline (ac-ft/yr)	0	78,056	78,056	247,604	+ 169 548	15,000	63,056	0
(7) Production By Energy Industry								
(a) Electrical Generation Capacity (megawatts)	0	8,574	8,574	13,613	+ 5,039	5,839	2,735	0
(b) Electrical Generation (gigawatts/hrs/yr)	0	50,828	50,828	68,124	+ 17,296	39,969	10,859	0
(c) Syngas Production (MC f/d)	0	500	500	0	500	0	500	0
(8) Land Conservation (Acceleration) (M acres)	0	12,980	12,980	12,980	0	18,669	+ 5 689	0
(9) Land Use Shift, Wildlife Agriculture to Recreation (acres)	532	1,210	1,742	768	974	1,610	132	592
(10) Hydroelectric Power Production								
(a) Electrical Generation Capacity (megawatts)	26	283	309	309	0	0	309	26
(b) Electrical Generation (gigawatts/hrs/yr)	106	56	162	162	0	0	162	106
E Total Plan (1,000 dollars)								
(1) Federal Cost	0	352,669	352,669	401,626	+ 48,957	193,847	158,822	0
(2) Nonfederal Cost	568,043	249,866	817,909	598,217	219,692	306,656	- 511,253	827 101
(3) Total Cost	568,043	602,535	1,170,578	999,843	170,735	500,503	- 670,075	827,101
(4) Associated Coal Industry Investment	0	(6,046,000)	(6,046,000)	(7,930,300)	+ (1,884,300)	(2,277,500)	- (3,768,500)	0
4 SOCIAL WELL-BEING, BENEFICIAL AND ADVERSE EFFECTS								
A Effects on Real Incomes								
(1) Increase Annual Income — Plan Components (M $)	18,090	62,813	80,903	70,523	- 10,380	59,350	21,553	33 405
(2) Increase Annual Income — Coal Industry (M $)	0	(189,250)	(189,250)	(258,220)	(68,970)	(71,025)	(118 225)	0
(3) Increase, Stabilize, Redistribute Income — Plan Components (M $)	36,180	125,626	161,806	141,046	20,760	118,700	43,106	66,810
(4) Increase, Stabilize, Redistribute Income — Coal Industry (M $)	0	(378,500)	(378,500)	(516,440)	+ (137,940)	(142,050)	(236,450)	0
B Security of Life, Health, and Safety								
(1) Provide Flood Protection, Urban Area (acres M people)	0	1,805/20	1,805/20	4,025/81	+ 2,220/61	0	1,805/20	0
(2) Provide Flood Regulation by Reservoirs (M ac-ft)	2,000	16,780	18,780	682 550	+ 663,770	0	18,780	2,000
(3) Increased Air Pollution Within State Standards (X)			See	Environmental Quality, 2C				
(4) Reduce ( ), Increase Water Pollution (X)			See	Environmental Quality, 2C				
(5) Added Dependable Food Supplies (X)	X	X	X	X	0	0	X	X
(6) Added Energy Supplies (X)	0	X	X	X	0	X	X	X
(7) Population Impact — Plan Components (No)	5,765	20,830	26,595	24,395	2,200	19,770	6,825	10 650
(8) Population Impact Coal Industry (No)	0	(63,085)	(63,085)	(86,075)	+ (22,990)	(23,675)	- (39,410)	0
C Educational, Cultural, and Recreational Opportunity								
(1) Added Hunting (hunting days)	1,250		1,250	1,250	0	1,250	0	1 250
(2) Added Fishing (fishing days)	41,700	325,700	367 400	427,100	+ 59 700	66,000	301 400	41 700
(3) Added Recreation (recreation days)	1,205,900	2,201,980	3,407,880	1,935,700	1 472 180	2,919,280	488,600	1 205 900
(4) Added Social/Health/Educational Pressures — Energy Related (X)	0	X	X	X	0	0	X	0

Table 67. Alternate Plan Capability — Upper Yellowstone

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit Year 2000	Remaining Need Or Opportunity	Recommended Plan			Alternative Plan Responses				
					Provided SRD	Provided NEO/EQ	Remaining Need	NED Provides	NED Remaining	EO Provides	EO Remaining	SRD All Programs
Agriculture (Irrigation)												
a Low (3E)	Ac	412,000	206,750	205,250	4,800[8]	(5,600[7])	191,010	(17,670[7])	189 774	0	205,250	
b High (3E')	Ac	442,000	206,750	235,250	4,800[8]	9,440[8]	221,010	15,476[8]	219 774	0	235 250	4,800
c Livestock (Beef, Hogs, Sheep)	M feed units E'	2,245	1,290	955	21	40	894	67	888	0	955	21
d Livestock Produced (Beef, Hogs, Sheep)	MM lbs. E'	187	135	52	2	2	48	4	48	0	52	1
Municipal, Rural Domestic, and Livestock Water	Ac-ft Consumed	26,800	26,800	0	0	0	0	0	0	0	0	0
Nonenergy Industrial Water	AF Consumed	10,800	10,800	0	0	0	0	0	0	0	0	0
Energy Industry (Coal)												
a Coal Production — Low	M tons	0	0	0	0	0	0	0	0	0	0	0
Coal Production — Most Probable	M tons	0	0	0	0	0	0	0	0	0	0	0
Coal Production — High	M tons	0	0	0	0	0	0	0	0	0	0	0
b Thermal Elec Capacity — Low	Megawatts	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Capacity — M Probable	Megawatts	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Capacity — High	Megawatts	0	0	0	0	0	0	0	0	0	0	0
c Thermal Elec Production — Low	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Production — M Probable	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Production — High	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
d Syngas Production — Low	MC fd	0	0	0	0	0	0	0	0	0	0	0
Syngas Production — M Prob	MC fd	0	0	0	0	0	0	0	0	0	0	0
Syngas Production — High	MC fd	0	0	0	0	0	0	0	C	0	0	0
e Water Consumed — Low	Ac-ft	0	0	0	0	0	0	0	0	0	0	0
Water Consumed — M Prob	Ac-ft	0	0	0	0	0	0	0	0	0	0	0
Water Consumed — High	Ac-ft	0	0	0	0	0	0	0	0	0	0	0
f Export-Rail/Slurry — High	M tons	0	0	0	0	0	0	0	0	0	0	0
Land Conservation Measures												
a Area Requiring Treatment	M Ac	1,515	621	894	0	447	447	447	447	447	447	0
b Capitalized Cost	M Dollars	59,840	21,263	38,577	0	19,462	19,115	19,462	19,115	19,462	19,115	0
Flood Control												
a Area Affected	M Ac	150	0	150	0	1	149	2	148	0	150	0
b Damage	M Dollars	3,444	0	3,444	0	8	3,436	342	3,102	0	3,444	0
Streambank Erosion[1]												
a Affected	Bank miles	237[1]	0	237	0	0	237	0	237	0	237	0
b Damage	M Dollars	532[1]	0	532	0	0	532	0	532	0	532	0

[1] Figures include both Upper and Lower Yellowstone main stems and major tributaries. Work is contemplated at 24 locations on the Yellowstone River under the 1974 Streambank Erosion Control and Demonstration Act of 1974 as amended by Water Resource Development Act of 1976

[7] Supplemental water supply

[8] Full water supply

Table 67. Alternate Plan Capability — Upper Yellowstone

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit. Year 2000	Remaining Need Or Opportunity	Recommended Plan			Alternative Plan Responses				
					Provided SRD	Provided NED/EQ	Remaining Need	NED Provides	NED Remaining	EQ Provides	EQ Remaining	SRD All Programs
Fish and Wildlife												
a Stream Fishing	Miles Lost to Reservoirs	—	—	—	0	6	—	8	—	2	—	0
b Lake Fishing (flat water)	M Acres	See "Fishing" Days			0	940	—	1,550	—	890	—	0
c Habitat Protected	M Acres	NA	NA	NA								
d Habitat Developed	M Acres	NA	NA	NA	0	1,810	NA	2,850	NA	1,360	NA	0
e Fishing	Days	1,062,053[3]	688,926[3]	187,127[4]	0	187,000	127	221,000	33,873	66,000	121,127	0
Outdoor Recreation												
a Land Area	Acres	3,234	0	3,234	204	110	2,920	0	3,234	314	2,920	204
b Water Area	Acres	9,961	0	9,961	0	1,810	8,151	2,850	7,111	1,360	8,601	0
c Wild, Scenic, Recr'n Rivers	Miles	388	0	388	163	225	0	0	388	388	0	163
d Recreation	Days	2,122,216	0	2,122,216	121,500	419,280	1,581,436	238,000	1,884,216	388,780	1,733,436	121,500
Water Quality Control and Instream Flow												
a Point Sources	W Q Standards				Assume compliance with "Water Quality Standards" by 1985							
b Nonpoint Sources	W Q Standards				Assume continued effort but longer term attainment of goals							
Instream Flows	State Program				Seek adequate legislation, reservations, and adequate administration							
Hydroelectric Power												
a Electric Generating Capacity	Megawatts	0	0	0	0	0	0	0	0	0	0	0
b Electric Generation	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0

[3] Projected demand and "Without" supply for aggregate of Upper Yellowstone, Clarks Fork-Bighorn, Tongue-Powder, and Lower Yellowstone
[4] About 50% of the indicated need assigned to the Upper Yellowstone Planning Area
NA — Not available

Table 68. Comparison of Alternative Plans — Upper Yellowstone

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD,
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Thousand Dollars)							
1. NATIONAL ECONOMIC DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS[1]								
A Value of Increased Outputs/Goods/Services, and Value of Resources								
(1) Multipurpose[2]								
Total Cost	0	6,586	6,586	12,676	+6,090	0	-6,586	0
Annual Cost	0	460	460	932	+472	0	-460	0
Annual Benefits	0	554	554	1,484	+930	0	-554	0
(2) Agriculture (Irrigation)								
Total Cost	10,449	12,613	[illegible],062	18,703	-4,359	0	-23,062	10,449
Annual Cost	719	943	1,662	1,411	-251	0	-1,662	719
Annual Benefits	590	996	1,586	1,926	+340	0	-1,586	590
(3) Energy Industry (Coal)								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(4) Land Conservation Measures (Acceleration)								
Total Cost	0	19,462	19,462	19,462	0	19,462	0	0
Annual Cost	0	1,577	1,577	1,577	0	1,577	0	0
Annual Benefits	0	1,577	1,577	1,577	0	1,577	0	0
(5) Flood Control								
Total Cost	0	100	100	3,720	+3,620	0	-100	0
Annual Cost	0	7	7	254	+247	0	-7	0
Annual Benefits	0	8	8	342	+334	0	-8	0
(6) Streambank Erosion								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(7) Fish and Wildlife								
Total Cost	0	9,621	9,621	0	-9,621	13,725	+4,104	0
Annual Cost	0	623	623	0	-623	957	+334	0
Annual Benefits	0	NA	NA	0	NA	NA	NA	0
(8) Outdoor Recreation								
Total Cost	15,662	39,724	55,386	1,177	-54,209	54,209	-1,177	15,662
Annual Cost	1,347	3,405	4,752	85	-4,667	4,671	-81	1,347
Annual Benefits	797	3,005	3,802	173	-3,629	3,629	-173	797
(9) Hydroelectric Power								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(10) Municipal/Industrial Water Supply								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(11) Total Plan								
Total Cost	26,111	81,520	107,631	43,062	-64,569	87,396	-20,235	26,111
Annual Cost	2,066	6,555	8,621	3,327	-5,294	7,205	-1,416	2,066
Annual Benefits	1,387	5,586	6,973	4,018	-2,955	5,206	-1,767	1,387

[1] NED, EQ, and SRD "Annual Benefits" are "Direct" only. SRD includes other benefits in RD Account only
[2] Costs and benefits allocated to respective functions
NA — Not available

Table 68. Comparison of Alternative Plans — Upper Yellowstone

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs. (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
2. ENVIRONMENTAL QUALITY, BENEFICIAL AND ADVERSE EFFECTS								
A. Open/Green Spaces, Wild/Scenic/Recreational Rivers, Lakes, and Areas of Natural Beauty								
(1) Create Lakes (surface acres)	0	1,810	1,810	2,850	+1,040	1,360	450	0
(2) Develop Greenbelts (X)	0	X	X	0	X	X	0	0
(3) Convert Agricultural/Other Lands to Wildlife Refuge (acres)	0	0[7]	0[7]	0	0	0[7]	0	0
(4) Land Conversion to Recreation Areas (acres)	204	110	314	0	314	314	0	204
(5) Wild/Scenic/Recreation Rivers (miles)	163	225	388	0	388	388	0	163
(6) Wild/Scenic/Recreation Rivers (easement acres)	20,900	54,158	75,058	0	75,058	75,058	0	20,900
B. Archaeological, Historical, Biological, and Geologic Resources, Selected Ecological Systems								
(1) Preserve Woodlands (acres) (Yellowstone River Islands)[7]	0	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]
(2) Preserve Unique Areas (acres) (Beartooth Wilderness Area)	0	613,500	613,500	0	613,500	613,500	[illegible]	[illegible]
(3) Preserve Add Wildlife Habitat (acres) (Broadview-Acton Basins)[7]	0	7	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
(4) Improve Wildlife Habitat (acres)	0	0	0	0	0	0	[illegible]	[illegible]
(5) Lose Stream Fishery (miles)	0	6	6	8	+2	2	4	[illegible]
(6) Add Lake Reservoir Fishery (acres)	0	940	940	1,550	+610	890	[illegible]	[illegible]
(7) Adopt Adequate Instream Flow Levels (X)[5]	Areawide	Areawide	X	0	X	Areawide	[illegible]	Areawide
C. Quality of Water, Air, and Land Resources								
(1) Accelerated Land Treatment (M acres)	0	447	447	447	0	447	[illegible]	[illegible]
(2) Reduction of Soil Loss/Sediment Yield Nutrients (X)	0	X	X	X	0	X	[illegible]	[illegible]
(3) Improve Water Quality by Low Streamflow Augmentation (miles)	0	X	General proposal for an augmentation on tributary streams to improve fishery					[illegible]
(4) Area Affected by Strip Mining (average — M acres/year)	0	0	0	0	0	[illegible]	[illegible]	[illegible]
(5) Streamflow Degradation — Chemical Content of Return Flows (X)	0	X	X	X	[illegible]	[illegible]	X	[illegible]
(6) Air Pollutant Emissions — Particulates (tons/year)	0	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]
(7) Air Pollutant Emissions — Sulfur Oxides (tons/year)	0	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]
(8) Air Pollutant Emissions — Nitrogen Oxides (tons/year)	0	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]
D. Irreversible Commitment of Resources to Future Uses								
(1) Conversion of Agricultural Land, Terrestrial Habitat, etc., to Reservoirs (acres)	0	1,810	1,810	2,850	+1,040	1,360	450	[illegible]
(2) Conversion — Agricultural Land to Energy Plant Sites (acres)	0	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]
(3) Streamflow Depletion — Added Irrigation (ac-ft)	10,200	25,800	36,000	31,500	4,500	[illegible]	3[illegible]	[illegible]
(4) Streamflow Depletion — Added Energy Industry Coal (ac-ft)	0	0	0	0	0	[illegible]	[illegible]	[illegible]
(5) Streamflow Depletion — Slurry Line Transport of Coal (ac-ft)	0	0	0	0	0	[illegible]	[illegible]	[illegible]
(6) Streamflow Depletion — Municipal/Industrial Water Supply (ac-ft)	0	4,000[6]	4,000	0	4,000	4,000[6]	[illegible]	[illegible]

[5] Also remove fish spawning barriers on three tributaries.

[6] Includes 4000 acre-feet streamflow depletion for fish/wildlife stream augmentation.

[7] There is a range of potentials, but not definite plan at this time (the Yellowstone River Islands acreage from Billings to Fairview is 144,000 acres).

Table 68. Comparison of Alternative Plans — Upper Yellowstone

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. REGIONAL DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS				(Thousand Dollars)				
A Value to Users of Increased Goods/Services — Study Area Residents								
(1) Agriculture (Irrigation)	1,334	996	2,330	1,926	−404	0	−2,330	1,334
(2) Energy Industry — Coal	0	0	0	0	0	0	0	0
(3) Land Conservation Measures — Accelerated	0	1,577	1,577	1,577	0	1,577	0	0
(4) Flood Control	0	8	8	342	+334	0	8	0
(5) Streambank Erosion	0	0	0	0	0	0	0	0
(6) Fish and Wildlife	0	NA	NA	NA	NA	NA	NA	0
(7) Outdoor Recreation	797	3,005	3,802	173	−3,629	3,629	173	797
(8) Hydroelectric Power	0	0	0	0	0	0	0	0
(9) Municipal/Industrial Water Supply	0	0	0	0	0	0	0	0
(10) Total Plan	2,131	5,586	7,717	4,018	3,699	5,206	−2,511	2 131
B Additional Income Accruing to Residents								
(1) Agriculture (Irrigation)	540	900	1,440	1,545	+105	0	−1,440	540
(2) Energy Industry — Coal	0	0	0	0	0	0	0	0
(3) Land Conservaton Measures — Accelerated	0	575	575	575	0	575	0	0
(4) Flood Control	0	8	8	23	+15	0	−8	0
(5) Fish and Wildlife	0	150	150	0	150	150	0	NA
(6) Outdoor Recreation	300	280	580	120	460	460	120	300
(7) Hydroelectric Power	0	0	0	0	0	0	0	0
(8) Municipal/Industrial Water Supply	0	0	0	0	0	0	0	0
(9) Total Plan	840	1,913	2,753	2,263	490	1,185	−1,568	840
C Net Beneficial Employment — Number of Jobs — Permanent Direct				(Units As Shown)				
(1) Agriculture (Irrigation)	36	60	96	103	+7	0	−96	36
(2) Energy Industry — Coal	0	0	0	0	0	0	0	0
(3) Land Conservation	0	310	310	310	0	310	0	0
(4) Flood Control	0	1	1	1	0	0	−1	0
(5) Fish and Wildlife	0	10	10	0	10	10	0	0
(6) Outdoor Recreation	15	14	29	6	−23	23	−6	15
(7) Hydroelectric Power	0	0	0	0	0	0	0	0
(8) Municipal/Industrial Water Supply	0	0	0	0	0	0	0	0
(9) Total	51	395	446	420	26	343	−103	51
D Regional Economic Base and Stability — To Year 2000								
(1) Convert Dry Land to Irrigated Agriculture (acres)	4,800	9,440	14,240	15,476	+1,236	0	−14,240	4,800
(2) Improve Irrigation Systems (acres)	1,700	0	1,700	0	−1,700	0	−1,700	1,700
(3) Provide Supplemental Irrigation Water Supply (acres)	0	5,600	5,600	17,670	+12,070	0	−5,600	0
(4) Provide Municipal/Industrial Water (ac-ft)	0	0	0	0	0	0	0	0
(5) Provide Coal for Regional/National Needs								
(a) Transport By Rail (M tons/year)	0	0	0	0	0	0	0	0
(b) Transport by Slurry Pipeline (M tons/year)	0	0	0	0	0	0	0	0
(c) Convert to Electricity in Study Area (M tons/year)	0	0	0	0	0	0	0	0
(d) Convert to Gas in Study Area (M tons/year)	0	0	0	0	0	0	0	0

Table 68. Comparison of Alternative Plans — Upper Yellowstone

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
(6) Provide Energy Industry Water Supply								
(a) Mines and Land Reclamation (ac-ft/yr)	0	0	0	0	0	0	0	0
(b) Coal Gasification (ac-ft/yr)	0	0	0	0	0	0	0	0
(c) Electric Generation (ac-ft/yr)	0	0	0	0	0	0	0	0
(d) Slurry Pipeline (ac-ft/yr)	0	0	0	0	0	0	0	0
(7) Production By Energy Industry								
(a) Electrical Generation Capacity (megawatts)	0	0	0	0	0	0	0	0
(b) Electrical Generation (gigawatts/hrs/yr)	0	0	0	0	0	0	0	0
(c) Syngas Production (MC f/d)	0	0	0	0	0	0	0	0
(8) Land Conservation (Acceleration) (M acres)	0	447	447	447	0	447	0	0
(9) Land Use Shift, Wildlife/Agriculture to Recreation (acres)	0	314	314	0	314	314	0	0
(10) Hydroelectric Power Production								
(a) Electrical Generation Capacity (megawatts)	0	0	0	0	0	0	0	0
(b) Electrical Generation (gigawatts/hrs/yr)	0	0	0	0	0	0	0	0
E Total Plan (1,000 dollars)								
(1) Federal Cost	0	56,746	56,746	15,244	41,502	53,267	3,479	0
(2) Nonfederal Cost	26,111	24,774	50,885	27,818	23,067	34,129	16,756	26 111
(3) Total Cost	26,111	81,520	107,631	43,062	64 569	87,396	20,235	26 111
(4) Associated Coal Industry Investment	0	0	0	0	0	0	0	0
4 SOCIAL WELL-BEING, BENEFICIAL AND ADVERSE EFFECTS								
A Effects on Real Incomes								
(1) Increase Annual Income — Plan Components (M $)	840	1,913	2 753	2,263	490	1 185	1 568	840
(2) Increase Annual Income — Coal Industry (M $)	0	0	0	0	0	0	0	0
(3) Increase Stabilize, Redistribute Income — Plan Components (M $)	1 680	3,826	5,506	4 526	980	2,370	3,136	1 680
(4) Increase Stabilize Redistribute Income — Coal Industry (M $)	0	0	0	0	0	0	0	0
B Security of Life Health and Safety								
(1) Provide Flood Protection, Urban Area (acres/M people)	0	0	0	2,080/60	+2,080/60	0	0	0
(2) Provide Flood Regulation by Reservoirs (M ac-ft)	0	0	0	0	0	0	0	0
(3) Increased Air Pollution Within State Standards (X)			See	Environmental Quality 2C				
(4) Reduce ( ), Increase Water Pollution (X)			See	Environmental Quality 2C				
(5) Added Dependable Food Supplies (X)	X	X	X	X	0	0	X	X
(6) Added Energy Supplies (X)	0	0	0	0	0	0	0	0
(7) Population Impact — Plan Components (No)	255	1 975	2,230	2 100	130	1 715	515	255
(8) Population Impact Coal Industry (No)	0	0	0	0	0	0	0	0
C Educational, Cultural, and Recreational Opportunity								
(1) Added Hunting (hunting days)	0	0	0	0	0	0	0	0
(2) Added Fishing (fishing days)	0	187,000	187 000	221 000	-34 000	66 000	121 000	0
(3) Added Recreation (recreation days)	121,500	419 280	540 780	238 000	302 780	388 780	152 000	121 500
(4) Added Social/Health/Educational Pressures — Energy Related (X)	0	0	0	0	0	0	0	0

Table 69. Alternate Plan Capability — Clarks Fork-Bighorn

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit Year 2000	Remaining Need Or Opportunity	Recommended Plan: Provided SRD	Recommended Plan: Provided NED/EQ	Recommended Plan: Remaining Need	Alternative Plan Responses: NED Provides	Alternative Plan Responses: NED Remaining	Alternative Plan Responses: EQ Provides	Alternative Plan Responses: EQ Remaining	Alternative Plan Responses: SRD All Programs
Agriculture (Irrigation)												
a Low (3E)	Ac	151,000	124,000	27,000	0	(11,300)[7]	22,670	(11 300)[7]	22 770	0	27,000	0
b High (3E')	Ac	149,000	124,000	25,000	0	49,670[8]	24 670	49 670[8]	24 670	0	25,000	0
c Livestock (Beef, Hogs, Sheep)	M feed units E'	1,326	1,120	206	0	401	195	401	195	0	206	0
d Livestock Produced (Beef, Hogs, Sheep)	MM lbs E'	112	86	26	0	52	26	52	26	0	26	0
Municipal, Rural Domestic, and Livestock Water	Ac-ft Consumed	16,600	16,600	0	0	0	0	0	0	0	0	0
Nonenergy Industrial Water	AF Consumed	Negl	Negl	0	0	0	0	0	0	0	0	0
Energy Industry (Coal)												
a Coal Production — Low	M tons	0	0	0	0	0	0	0	0	0	0	0
Coal Production — Most Probable	M tons	0	0	0	0	0	0	0	0	0	0	0
Coal Production — High	M tons	0	0	0	0	0	0	0	0	0	0	0
b Thermal Elec Capacity — Low	Megawatts	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Capacity — M Probable	Megawatts	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Capacity — High	Megawatts	0	0	0	0	0	0	0	0	0	0	0
c Thermal Elec Production — Low	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Production — M Probable	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Production — High	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
d Syngas Production — Low	MC fd	0	0	0	0	0	0	0	0	0	0	0
Syngas Production — M Prob	MC fd	0	0	0	0	0	0	0	0	0	0	0
Syngas Production — High	MC fd	0	0	0	0	0	0	0	0	0	0	0
e Water Consumed — Low	Ac-ft	0	0	0	0	0	0	0	0	0	0	0
Water Consumed — M Prob	Ac-ft	0	0	0	0	0	0	0	0	0	0	0
Water Consumed — High	Ac-ft	0	0	0	0	0	0	0	0	0	0	0
f Export-Rail/Slurry — High	M tons	0	0	0	0	0	0	0	0	0	0	0
Land Conservation Measures												
a Area Requiring Treatment	M Ac	1,371	549	822	0	410	412	410	412	410	412	0
b Capitalized Cost	M Dollars	29,554	10,357	19,197	0	9,599	9,598	9,599	9,598	9,599	9,598	0
Flood Control												
a Area Affected	M Ac	49	0	49	0	0	49	0	49	0	49	0
b Damage	M Dollars	367	0	367	0	0	367	0	367	0	367	0
Streambank Erosion[1]												
a Affected	Bank miles	81	0	81	0	0	81	0	81	0	81	0
b Damage	M Dollars	141	0	141	0	0	141	0	141	0	141	0

[1] Main stems only, exclusive of tributary areas
[7] Supplemental water supply
[8] Full water supply

Table 69. Alternate Plan Capability — Clarks Fork-Bighorn

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit Year 2000	Remaining Need Or Opportunity	Recommended Plan			Alternative Plan Responses				
					Provided SRD	Provided NED/EQ	Remaining Need	NED		EQ		SRD
								Provides	Remaining	Provides	Remaining	All Programs
Fish and Wildlife												
a Stream Fishing	Miles Lost to Reservoirs	—	—	—	0	3	—	3		0	—	0
b. Lake Fishing (flat water)	M Acres	See "Fishing" Days			0	595	—	595	—	0	—	0
c Habitat Protected	M Acres	NA	NA	NA	0							0
d Habitat Developed	M Acres	NA	NA	NA	0							0
e Fishing	Days	1,062,053[3]	688,926[3]	132,700[4]	0	132,700	0	132,700	0	0	132,700	0
Outdoor Recreation												
a Land Area	Acres	67	0	67	68	72	73	0	67	140	73	68
b Water Area	Acres	495	0	495	0	704	209	704	209	0	495	0
c Wild, Scenic Recr'n Rivers	Miles	125	0	125	50	75	0	0	125	125	0	50
d Recreation	Days	28,849*	0	28,849*	150,000	294,100	472,949	166 600	195 449	277 500	306,349	[illegible]
Water Quality Control and Instream Flow												
a Point Sources	W Q Standards				Assume compliance with "Water Quality Standards" by 1985							
b Nonpoint Sources	W Q Standards				Assume continued effort but longer term attainment of goal							
Instream Flows	State Program				Seek adequate legislation, reservations, and adequate administration							
Hydroelectric Power												
a Electric Generating Capacity	Megawatts	11	0	11	0	11	0	11	0	0	11	
b Electric Generation	Gigawatts hrs yr	56	0	56	0	56	0	56	0	0	56	0

[3] Projected demand and "Without" supply for aggregate of Upper Yellowstone, Clarks Fork Bighorn, Tongue-Powder, and Lower Yellowstone Planning Areas
[4] About 35% of the indicated need assigned to the Clarks Fork Bighorn Planning Area
NA — Not available
* Surplus overall

Table 70. Comparison of Alternative Plans — Clarks Fork-Bighorn

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs. (4)	Provided	(7) vs. (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. **NATIONAL ECONOMIC DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS**[1]	(Thousand Dollars)							
A Value of Increased Outputs/Goods/Services, and Value of Resources								
(1) Multipurpose[2]								
Total Cost	0	5,408	5,408	5,408	0	0	-5,408	0
Annual Cost	0	393	393	393	0	0	-393	0
Annual Benefits	0	683	683	683	0	0	683	0
(2) Agriculture (Irrigation)								
Total Cost	0	72,662	72,662	72,662	0	0	-72,662	0
Annual Cost	0	4,909	4,909	4,909	0	0	-4,909	0
Annual Benefits	0	7,113	7,113	7,113	0	0	-7,113	0
(3) Energy Industry (Coal)								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(4) Land Conservation Measures (Acceleration)								
Total Cost	0	9,599	9,599	9,599	0	9,599	0	0
Annual Cost	0	778	778	778	0	778	0	0
Annual Benefits	0	778	778	778	0	778	0	0
(5) Flood Control								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(6) Streambank Erosion								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(7) Fish and Wildlife								
Total Cost	0	100	100	100	0	0	-100	0
Annual Cost	0	8	8	8	0	0	8	0
Annual Benefits	0	7	7	7	0	0	-7	0
(8) Outdoor Recreation								
Total Cost	8,044	12,329	20,373	383	-19,990	19,990	-383	8,044
Annual Cost	699	971	1,670	28	1,642	1,642	28	699
Annual Benefits	525	545	1,070	238	-832	832	-238	525
(9) Hydroelectric Power								
Total Cost	0	10,490	10,490	10,490	0	0	-10,490	0
Annual Cost	0	751	751	751	0	0	-751	0
Annual Benefits	0	1,128	1,128	1,128	0	0	-1,128	0
(10) Municipal/Industrial Water Supply								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(11) Total Plan								
Total Cost	8,044	105,180	113,224	93,234	-19,990	29,589	-83,635	8,044
Annual Cost	699	7,417	8,116	6,474	-1,642	2,420	-5,696	699
Annual Benefits	525	9,571	10,096	9,264	-832	1,610	-8,486	525

[1] NED, EQ, and SRD "Annual Benefits" are "Direct" only. SRD includes other benefits in R D Account only

[2] Costs and benefits allocated to respective functions

Table 70. Comparison of Alternative Plans — Clarks Fork-Bighorn

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
2. ENVIRONMENTAL QUALITY, BENEFICIAL AND ADVERSE EFFECTS								
A Open/Green Spaces, Wild/Scenic/Recreational Rivers, Lakes, and Areas of Natural Beauty								
(1) Create Lakes (surface acres)	0	704	704	704	0	0	704	0
(2) Develop Greenbelts (X)	0	X	X	0	- X	X	0	0
(3) Convert Agricultural/Other Lands to Wildlife Refuge (acres)	0	0	0	0	0	0	0	0
(4) Land Conversion to Recreation Areas (acres)	68	72	140	0	- 140	140	0	68
(5) Wild/Scenic/Recreation Rivers (miles)	125	0	125	0	- 125	125	0	125
(6) Wild/Scenic/Recreation Rivers (easement acres)	11,000	16,500	27,500	0	27,500	27,500	0	11,000
B Archaeological, Historical, Biological, and Geologic Resources, Selected Ecological Systems								
(1) Preserve Woodlands (acres) (+ or −)	0	X	X	0	- X	X	0	0
(2) Preserve Unique Areas (acres) (Beartooth Wilderness Area)	0	300,000	300,000	0	300,000	300,000	0	0
(3) Preserve/Add Wildlife Habitat (acres)	0	0	0	0	0	0	0	0
(4) Improve Wildlife Habitat (acres)	0	See Greenbelts		0	0	See Greenbelts	0	0
(5) Lose Stream Fishery (miles)	0	3	3	3	0	0	3	0
(6) Add Lake/Reservoir Fishery (acres)	0	595	595	595	0	0	- 595	0
(7) Adopt Adequate Instream Flow Levels (X)	Areawide	Areawide	X	0	X	Areawide	0	Areawide
C Quality of Water, Air and Land Resources								
(1) Accelerated Land Treatment (M acres)	0	410	410	410	0	410	0	0
(2) Reduction of Soil Loss/Sediment Yield/Nutrients (X)	0	X	X	X	0	X	0	0
(3) Improve Water Quality by Low Streamflow Augmentation (miles)	0	0	0	0	0	0	0	0
(4) Area Affected by Strip Mining (average — M acres/year)	0	0	0	0	0	0	0	0
(5) Streamflow Degradation — Chemical Content of Return Flows (X)	0	X	X	X	0	0	X	0
(6) Air Pollutant Emissions — Particulates (tons/year)	0	0	0	0	0	0	0	0
(7) Air Pollutant Emissions — Sulfur Oxides (tons/year)	0	0	0	0	0	0	0	0
(8) Air Pollutant Emissions — Nitrogen Oxides (tons/year)	0	0	0	0	0	0	0	0
D Irreversible Commitment of Resources to Future Uses								
(1) Conversion of Agricultural Land, Terrestrial Habitat, etc. to Reservoirs (acres)	0	704	704	704	0	0	704	0
(2) Conversion — Agricultural Land to Energy Plant Sites (acres)	0	0	0	0	0	0	0	0
(3) Streamflow Depletion — Added Irrigation (ac-ft)	0	139,653	139,653	139,653	0	0	139,653	0
(4) Streamflow Depletion — Added Energy Industry — Coal (ac-ft)	0	0	0	0	0	0	0	0
(5) Streamflow Depletion — Slurry Line Transport of Coal (ac-ft)	0	0	0	0	0	0	0	0
(6) Streamflow Depletion — Municipal/Industrial Water Supply (ac-ft)	0	0	0	0	0	0	0	0

Table 70. Comparison of Alternative Plans — Clarks Fork-Bighorn

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs. (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. REGIONAL DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS				(Thousand Dollars)				
A Value to Users of Increased Goods/Services — Study Area Residents								
(1) Agriculture (Irrigation)	0	7,113	7,113	7,113	0	0	7 113	0
(2) Energy Industry — Coal	0	0	0	0	0	0	0	0
(3) Land Conservation Measures — Accelerated	0	778	778	778	0	778	0	0
(4) Flood Control	0	0	0	0	0	0	0	0
(5) Streambank Erosion	0	0	0	0	0	0	0	0
(6) Fish and Wildlife	0	7	7	7	0	0	7	0
(7) Outdoor Recreation	1,315	545	1,860	238	1,622	832	-1,028	1,315
(8) Hydroelectric Power	0	1,128	1,128	1,128	0	0	1,128	0
(9) Municipal/Industrial Water Supply	0	0	0	0	0	0	0	0
(10) Total Plan	1,315	9,571	10,886	9,264	1,622	1,610	9,276	1,315
B Additional Income Accruing to Residents								
(1) Agriculture (Irrigation)	0	5,295	5,295	5,295	0	0	5,295	0
(2) Energy Industry — Coal	0	0	0	0	0	0	0	0
(3) Land Conservaton Measures — Accelerated	0	2,800	2,800	2,800	0	2,800	0	0
(4) Flood Control	0	0	0	0	0	0	0	0
(5) Fish and Wildlife	0	0	0	10	+10	0	0	0
(6) Outdoor Recreation	120	100	220	30	190	220	0	120
(7) Hydroelectric Power	0	840	840	840	0	0	840	0
(8) Municipal/Industrial Water Supply	0	0	0	0	0	0	0	0
(9) Total Plan	120	9,035	9,155	8,975	180	3,020	6,135	120
C Net Beneficial Employment — Number of Jobs — Permanent Direct				(Units As Shown)				
(1) Agriculture (Irrigation)	0	355	355	355	0	0	-355	0
(2) Energy Industry — Coal	0	0	0	0	0	0	0	0
(3) Land Conservation	0	147	147	147	0	147	0	0
(4) Flood Control	0	0	0	0	0	0	0	0
(5) Fish and Wildlife	0	0	0	0	0	0	0	0
(6) Outdoor Recreation	6	5	11	0	-11	11	0	6
(7) Hydroelectric Power	0	28	28	28	0	0	-28	0
(8) Municipal/Industrial Water Supply	0	0	0	0	0	0	0	0
(9) Total	6	535	541	530	11	158	383	6
D Regional Economic Base and Stability — To Year 2000								
(1) Convert Dry Land to irrigated Agriculture (acres)	0	49,670	49,670	49,670	0	0	49,670	0
(2) Improve Irrigation Systems (acres)	0	0	0	0	0	0	0	0
(3) Provide Supplemental Irrigation Water Supply (acres)	0	11,300	11,300	11,300	0	0	11,300	0
(4) Provide Municipal/Industrial Water (ac-ft)	0	0	0	0	0	0	0	0
(5) Provide Coal for Regional/National Needs								
(a) Transport By Rail (M tons/year)	0	0	0	0	0	0	0	0
(b) Transport by Slurry Pipeline (M tons/year)	0	0	0	0	0	0	0	0
(c) Convert to Electricity in Study Area (M tons/year)	0	0	0	0	0	0	0	0
(d) Convert to Gas in Study Area (M tons/year)	0	0	0	0	0	0	0	0

Table 70. Comparison of Alternative Plans — Clarks Fork-Bighorn

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
(6) Provide Energy Industry Water Supply								
(a) Mines and Land Reclamation (ac-ft/yr)	0	0	0	0	0	0	0	0
(b) Coal Gasification (ac-ft/yr)	0	0	0	0	0	0	0	0
(c) Electric Generation (ac-ft/yr)	0	0	0	0	0	0	0	0
(d) Slurry Pipeline (ac-ft/yr)	0	0	0	0	0	0	0	0
(7) Production By Energy Industry								
(a) Electrical Generation Capacity (megawatts)	0	0	0	0	0	0	0	0
(b) Electrical Generation (gigawatts/hrs/yr)	0	0	0	0	0	0	0	0
(c) Syngas Production (MC f/d)	0	0	0	0	0	0	0	0
(8) Land Conservation (Acceleration) (M acres)	0	410	410	410	0	410	0	0
(9) Land Use Shift, Wildlife Agriculture to Recreation (acres)	68	72	140	0	140	140	0	68
(10) Hydroelectric Power Production								
(a) Electrical Generation Capacity (megawatts)	0	11	11	11	0	0	11	0
(b) Electrical Generation (gigawatts hrs yr)	0	56	56	56	0	0	56	0
E Total Plan (1 000 dollars)								
(1) Federal Cost	0	59 553	59 553	47 60[illegible]	11 946	12 249	47 304	0
(2) Nonfederal Cost	8 044	45 627	53 671	45 627	8 044	17 340	36 [illegible]	8 044
(3) Total Cost	8 044	105 180	113 224	93 234	19 990	29 589	83 6[illegible]	8 044
(4) Associated Coal Industry Investment	0	0	0	0	0	0	0	0
4 SOCIAL WELL-BEING BENEFICIAL AND ADVERSE EFFECTS								
A Effects on Real Incomes								
(1) Increase Annual Income — Plan Components (M $)	120	9 035	9 155	8 975	180	3 020	6 135	120
(2) Increase Annual Income — Coal Industry (M $)	0	0	0	0	0	0	0	0
(3) Increase Stabilize Redistribute Income — Plan Components (M $)	4 350	16 320	20 670	14 070	6 600	[illegible]	11 920	4 350
(4) Increase Stabilize Redistribute Income Coal Industry (M $)	0	0	0	0	0	0	0	0
B Security of Life Health and Safety								
(1) Provide Flood Protection Urban Area (acres M people)	0	0	0	0	0		0	
(2) Provide Flood Regulation by Reservoirs (M ac ft)	0	0	0	0	0		0	
(3) Increased Air Pollution Within State Standards (X)				See Environmental Quality				
(4) Reduce ( ) Increase Water Pollution (X)				See Environmental Quality				
(5) Added Dependable Food Supplies (X)	0	X	X	X	0	0	X	
(6) Added Energy Supplies (X)	0	0	0	0	0	0	0	
(7) Population Impact — Plan Components (No)	30	2 675	2 705	2 650	[illegible]	[illegible]	[illegible]	[illegible]
(8) Population Impact Coal Industry (No)	0	0	0	0	0	0	0	0
C Educational Cultural and Recreational Opportunity								
(1) Added Hunting (hunting days)	0	0	0	0	0		0	0
(2) Added Fishing (fishing days)	0	[illegible]	[illegible]	[illegible]	0		[illegible]	0
(3) Added Recreation (recreation days)	150 000	294 100	444 100	166 600	[illegible]	[illegible]	166 [illegible]	[illegible]
(4) Added Social Health Educational Pressures — Energy Related (X)	0		0	0	0	0	0	0

Table 71. Alternate Plan Capability — Tongue-Powder

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit. Year 2000	Remaining Need Or Opportunity	Recommended Plan			Alternative Plan Responses				
					Provided SRD	Provided NED/EQ	Remaining Need	NED		EQ		SRD
								Provides	Remaining	Provides	Remaining	All Programs
Agriculture (Irrigation)												
a Low (3E)	Ac	118,000	36,000	82,000	13,000[8]	0	69 000	(6,300[7])	64,000	0	82,000	13,000[8]
b High (3E')	Ac	116,000	36,000	80,000	13,000[8]	0	67,000	18,000[8]	62,000	0	80,000	13,000[8]
c Livestock (Beef, Hogs, Sheep)	M feed units E'	1,288	986	302	47	0	255	65	237	0	302	47
d Livestock Produced (Beef, Hogs, Sheep)	MM lbs E'	104	76	28	4	0	24	6	22	0	28	4
Municipal, Rural Domestic,	Ac-ft							0	0	0		0
and Livestock Water	Consumed	28,100	13,100	(15,000)	See Municipal/Industrial Water Supply							See M-Ind
Nonenergy Industrial Water	AF Consumed	Negl	Negl	Negl	0	0	0	0	0	0	0	0
Energy Industry (Coal)												
a Coal Production — Low	M tons	25,000										
Coal Production — Most Probable	M tons	200,000										
Coal Production — High	M tons	200,000	98,000	(102,000)	0	(98,000)	(102,000)	(203,000)	−(3,000)	(16,000)	(184,000)	0
b Thermal Elec Capacity — Low	Megawatts	900										
Thermal Elec Capacity — M Probable	Megawatts	1,370										
Thermal Elec Capacity — High	Megawatts	900	0	(900)	0	0	(900)	0	(900)	0	(900)	0
c Thermal Elec Production — Low	Gigawatts/hrs/yr	5,519										
Thermal Elec Production — M Probable	Gigawatts/hrs/yr	7,001										
Thermal Elec Production — High	Gigawatts/hrs/yr	5,521	0	(5,521)	0	0	(5,521)	0	(5,521)	0	(5,521)	0
d Syngas Production — Low	MC fd	0										
Syngas Production — M Prob	MC fd	0										0
Syngas Production — High	MC fd	0	0	0	0	250	−(250)	0	−(250)	0	0	0
e Water Consumed — Low	Ac-ft	15,702										
Water Consumed — M Prob	Ac-ft	32,742										
Water Consumed — High	Ac-ft	55,607	47,448	(8,159)	0	(34,248)	(21,359)	(72,460)	−(16,853)	(1,216)	(54,391)	0
f Export-Rail/Slurry — High	M tons	196,900	21,900	(175,000)	0	(88,000)	(108,900)	(203,000)	−(6,100)	(16,000)	(180,900)	0
Land Conservation Measures												
a Area Requiring Treatment	M Ac	2,494	1,055	1,439	0	721	718	721	718	721	718	0
b Capitalized Cost	M Dollars	30,323	11,923	18,400	0	9,754	8,636	9,754	8,636	9,754	8,636	0
Flood Control												
a Area Affected	M Ac	117	0	117	12	0	105	110	7	0	117	12
b Damage	M Dollars	760	0	760	92	442	226	712	48	0	760	92
Streambank Erosion[1]												
a Affected	Bank miles	215[1]	0	215	0	0	215	0	215	0	215	0
b Damage	M Dollars	209[1]	0	209	0	0	209	0	209	0	209	0

[1] Main stems only, exclusive of tributary areas
[7] Supplemental water supply
[8] Full water supply

Table 71. Alternate Plan Capability — Tongue-Powder

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit Year 2000	Remaining Need Or Opportunity	Recommended Plan: Provided SRD	Recommended Plan: Provided NED/EQ	Recommended Plan: Remaining Need	Alternative Plan Responses NED: Provides	NED: Remaining	EQ: Provides	EQ: Remaining	SRD: All Programs
Fish and Wildlife												
a Stream Fishing	Miles Lost to Reservoirs	—	—	—	6	0	—	36	—	0	—	6
b Lake Fishing (flat water)	M Acres	See "Fishing" Days			1,000	0	—	7,000	—	0	—	1,000
c Habitat Protected	M Acres	NA	NA	NA		Greenbelts				Greenbelts		0
d Habitat Developed	M Acres	NA	NA	NA		0		0		0		0
e Fishing	Days	1,062,053[3]	688,926[3]	37,300[4]	10,000	0	27,300	21,500	15,800	0	37 300	10,000
Outdoor Recreation												
a Land Area	Acres	196	0	196	136	0	60	0	196	136	60	136
b Water Area	Acres	2,746	0	2,746	2,700	0	46	20,900	18 154	0	2 746	2 700
c Wild, Scenic, Recr'n Rivers	Miles	115	0	115	115	0	0	0	115	115	0	115
d Recreation	Days	129,897	0	129,897	216,500	0	86,603	125,000	4,897	172 500	42 603	216 500
Water Quality Control and Instream Flow												
a Point Sources	W Q Standards				Assume compliance with Water Quality Standards by 1985							
b Nonpoint Sources	W Q Standards				Assume continued efforts but longer term attainment of goals							
Instream Flows	State Program				Seek adequate legislation, reservations, and adequate administration							
Hydroelectric Power												
a Electric Generating Capacity	Megawatts	6	0	6	6	0	0	6	0	0	6	6
b Electric Generation	Gigawatts/hrs/yr	21	0	21	21	0	0	21	0	0	21	21
Municipal/Industrial Water Supply	Acre Feet		-	15,000	15,000	0	0	15,000	0	0	15 000	15 000

[2] Projected demand and Without supply for aggregate of Upper Yellowstone Clarks Fork-Bighorn Tongue Powder and Lower Yellowstone Planning Areas
[3] About 10% of the indicated need assigned to the Tongue-Powder Planning Area
NA — Not available

Table 72. Comparison of Alternative Plans — Tongue-Powder

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Thousand Dollars)							
1. NATIONAL ECONOMIC DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS[1]								
A Value of Increased Outputs/Goods/Services, and Value of Resources								
(1) Multipurpose[2]								
Total Cost	49,235	0	49,235	137,318	+88,083	0	49,235	49,235
Annual Cost	3,622	0	3,622	9,968	+6,346	0	3 622	3,622
Annual Benefits	3,622	0	3,622	12,032	+8,410	0	3,622	3,622
(2) Agriculture (Irrigation)								
Total Cost	14,426	0	14,426	24,836	+10,410	0	14,426	14,426
Annual Cost	1,062	0	1,062	1,810	+748	0	1,062	1,062
Annual Benefits	1,062	0	1,062	1,820	+758	0	1 062	1,062
(3) Energy Industry (Coal)[3]								
Total Cost	0	(1,560,000)	(1,560,000)	(1,157,100)	(402,900)	(91,200)	(1,468,800)	0
Annual Cost	0	(375,180)	(375,180)	(500,960)	+(125,780)	(88,877)	(286,303)	0
Annual Benefits	0	(383,900)	(383,900)	(589,060)	+(205,160)	(104 390)	(279,510)	0
(4) Land Conservation Measures (Acceleration)								
Total Cost	0	9,754	9,754	9,754	0	9,754	0	0
Annual Cost	0	790	790	790	0	790	0	0
Annual Benefits	0	790	790	790	0	790	0	0
(5) Flood Control								
Total Cost	1,822	5,170	6,992	8,115	+3,926	0	4 189	1,822
Annual Cost	134	363	497	588	+284	0	304	134
Annual Benefits	92	442	534	712	+388	0	324	92
(6) Streambank Erosion								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(7) Fish and Wildlife								
Total Cost	1,379	0	1,379	2,318	+939	0	1,379	1,379
Annual Cost	100	0	100	170	+70	0	100	100
Annual Benefits	100	0	100	189	+89	0	100	100
(8) Outdoor Recreation								
Total Cost	19,777	0	19,777	2,318	-17,459	18,398	1,379	19,777
Annual Cost	1,520	0	1,520	170	1,350	1,419	101	1,520
Annual Benefits	687	0	687	195	-492	587	-100	687
(9) Hydroelectric Power								
Total Cost	6,893	0	6,893	6,893	0	0	6,893	6,893
Annual Cost	500	0	500	500	0	0	500	500
Annual Benefits	511	0	511	511	0	0	511	511
(10) Municipal/Industrial Water Supply								
Total Cost	23,336	0	23,336	95,205	+71,869	0	23,336	23,336
Annual Cost	1,726	0	1,726	6,900	+5,174	0	-1,726	1,726
Annual Benefits	1,757	0	1,757	8,837	+7,080	0	-1,757	1,757
(11) Total Plan								
Total Cost	67,633	14,924	82,557	149,439	+69,685	28,152	51,602	67,633
Annual Cost	5,042	1,153	6,195	10,928	+4,926	2,209	3,793	5,042
Annual Benefits	4,209	1,232	5,441	13,054	+7,823	1,377	3,854	4,209

[1] NED, EQ, and SRD "Annual Benefits" are "Direct" only, SRD includes other benefits in R D Account only

[2] Costs and benefits allocated to respective functions

[3] Energy Industry figures ( ) are not included in "Total Plan"

Table 72. Comparison of Alternative Plans — Tongue-Powder

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
2. ENVIRONMENTAL QUALITY. BENEFICIAL AND ADVERSE EFFECTS								
A Open/Green Spaces Wild/Scenic/Recreational Rivers Lakes, and Areas of Natural Beauty								
(1) Create Lakes (surface acres)	2,700	0	2 700	20,900	+18,200	0	[illegible] 700	2 [illegible]
(2) Develop Greenbelts (X)	0	X	X	X	0	X	0	0
(3) Convert Agricultural/Other Lands to Wildlife Refuge (acres)	0	0	0	0	0	0	0	0
(4) Land Conversion to Recreation Areas (acres)	136	0	136	0	136	136	0	136
(5) Wild/Scenic Recreation Rivers (miles)	115	0	115	0	115	115	0	115
(6) Wild/Scenic/Recreation Rivers (easement acres)	25,300	0	25,300	0	25,300	25,300	0	25 [illegible]
B Archaeological Historical, Biological and Geologic Resources Selected Ecological Systems								
(1) Preserve Woodlands (acres) (+ or)	0	See Greenbelts	—	0	0	See Greenbelts	0	[illegible]
(2) Preserve Unique Areas (acres)	0	0	0	0	0	0	0	[illegible]
(3) Preserve/Add Wildlife Habitat (acres)	0	X	X	0	X	X	0	[illegible]
(4) Improve Wildlife Habitat (acres)	0	X	X	0	X	X	0	[illegible]
(5) Lose Stream Fishery (miles)	6	0	6	36	+30	0	6	6
(6) Add Lake/Reservoir Fishery (acres)	1,000	0	1 000	7 000	+6 000	0	1 [illegible]	[illegible]
(7) Adopt Adequate Instream Flow Levels (X)	Areawide	Areawide	X	0	X	Areawide	0	Areawide
C Quality of Water Air and Land Resources								
(1) Accelerated Land Treatment (M acres)	0	721	721	721	0	721	0	[illegible]
(2) Reduction of Soil Loss/Sediment Yield Nutrients (X)	0	X	X	X	0	X	0	[illegible]
(3) Improve Water Quality by Low Streamflow Augmentation (miles)	55	0	55	55	0	0	55	[illegible]
(4) Area Affected by Strip Mining (average — M acres year)[a]	0	1,411	1 411	2 923	+1 512	[illegible]	1 181	[illegible]
(5) Streamflow Degradation Chemical Content of Return Flows (X)	X	X	X	X	0	0	X	X
(6) Air Pollutant Emissions — Particulates (tons year)	0	1,017	1 017	0	1 017	0	1 [illegible]	[illegible]
(7) Air Pollutant Emissions — Sulfur Oxides (tons/year)	0	11 172	11 172	0	11 172	0	11 1[illegible]	[illegible]
(8) Air Pollutant Emissions — Nitrogen Oxides (tons year)	0	7,457	7,457	0	7 457	0	[illegible]	[illegible]
D Irreversible Commitment of Resources to Future Uses								
(1) Conversion of Agricultural Land Terrestrial Habitat etc to Reservoirs (acres)	2 700	0	2 700	20 900	+18 200	0	2 [illegible]	[illegible]
(2) Conversion — Agricultural Land to Energy Plant Sites (acres)	0	3,440	3 440	6 090	+2 650	480	2 96[illegible]	[illegible]
(3) Streamflow Depletion — Added Irrigation (ac ft)	29 250	0	29 250	41 750	+12 500	0	29 [illegible]	[illegible]9 [illegible]
(4) Streamflow Depletion Added Energy Industry — Coal (ac-ft)	0	17 448	17 448	4 060	13 388	1 216	16 [illegible]	0
(5) Streamflow Depletion — Slurry Line Transport of Coal (ac ft)	0	16,800	16,800	68 400	+51 600	0	16 [illegible]	0
(6) Streamflow Depletion Municipal Industrial Water Supply (ac ft)	28 750	0	28 750	121 250	+92 500	0	28 [illegible]	[illegible]8 [illegible]

[a] Five to 25 year lag to attain full productivity through land reclamation

Table 72. Comparison of Alternative Plans — Tongue-Powder

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. REGIONAL DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS	(Thousand Dollars)							
A Value to Users of Increased Goods/Services — Study Area Residents								
(1) Agriculture (Irrigation)	1,062	0	1,062	1,820	+758	0	-1,062	1,062
(2) Energy Industry — Coal	0	(383,900)	(383,900)	(589,060)	+(205,160)	(104,390)	(279 510)	0
(3) Land Conservation Measures — Accelerated	0	790	790	790	0	790	0	0
(4) Flood Control	92	232	324	712	+388	0	-324	92
(5) Streambank Erosion	0	0	0	0	0	0	0	0
(6) Fish and Wildlife	100	0	100	189	+89	0	-100	100
(7) Outdoor Recreation	687	0	687	195	-492	587	100	687
(8) Hydroelectric Power	511	0	511	511	0	0	-511	511
(9) Municipal/Industrial Water Supply	1,757	0	1,757	8,837	+7,080	0	1,757	1,757
(10) Total Plan	4,209	1,022	5,231	13,054	+7,823	1,377	3,854	4,209
B Additional Income Accruing to Residents								
(1) Agriculture (Irrigation)	1,245	0	1,245	1,785	+540	0	1,245	1,245
(2) Energy Industry — Coal	0	(39,510)	(39,510)	(62 415)	+(22,905)	(4,920)	-(34 590)	0
(3) Land Conservaton Measures — Accelerated	0	2,900	2,900	2 900	0	2,900	0	0
(4) Flood Control	15	15	30	45	+15	0	-30	15
(5) Fish and Wildlife	15	0	15	30	+15	0	15	15
(6) Outdoor Recreation	180	0	180	30	-150	160	20	180
(7) Hydroelectric Power	750	0	750	750	0	0	-750	750
(8) Municipal/Industrial Water Supply	60	0	60	75	+15	0	-60	60
(9) Total Plan	2,265	2,915	5,180	5,615	+435	3,060	-2,120	2,265
C Net Beneficial Employment — Number of Jobs — Permanent Direct	(Units As Shown)							
(1) Agriculture (Irrigation)	83	0	83	119	+36	0	-83	83
(2) Energy Industry — Coal	0	(2,634)	(2,634)	(4 161)	+(1,527)	(328)	-(2,306)	0
(3) Land Conservation	0	155	155	155	0	155	0	0
(4) Flood Control	1	1	2	3	+1	0	2	1
(5) Fish and Wildlife	1	0	1	2	+1	0	-1	1
(6) Outdoor Recreation	9	0	9	2	-7	8	1	9
(7) Hydroelectric Power	25	0	25	25	0	0	-25	25
(8) Municipal/Industrial Water Supply	4	0	4	5	+1	0	4	4
(9) Total	123	156	279	311	+32	163	-116	123
D Regional Economic Base and Stability — To Year 2000								
(1) Convert Dry Land to Irrigated Agriculture (acres)	13,000	0	13,000	18,000	+5,000	0	-13,000	13,000
(2) Improve Irrigation Systems (acres)	0	0	0	0	0	0	0	0
(3) Provide Supplemental Irrigation Water Supply (acres)	0	0	0	6,300	+6,300	0	0	0
(4) Provide Municipal/Industrial Water (ac-ft)	28,750	0	28,750	121,250	+92,500	0	28,750	28,750
(5) Provide Coal for Regional/National Needs								
(a) Transport By Rail (M tons/year)	0	60,000	60,000	89,000	+29,000	16,000	-44,000	0
(b) Transport by Slurry Pipeline (M tons/year)	0	28,000	28,000	114,000	+86,000	0	-28,000	0
(c) Convert to Electricity in Study Area (M tons/year)	0	0	0	0	0	0	0	0
(d) Convert to Gas in Study Area (M tons/year)	0	10,000	10,000	0	-10,000	0	-10,000	0

Table 72. Comparison of Alternative Plans — Tongue-Powder

Account and Component	Recommended Plan (RP) Provided: SRD	Recommended Plan (RP) Provided: NED/EQ	Recommended Plan (RP): Total	National Economic Development Plan (NED): Provided	NED: (5) vs (4)	Environmental Quality Plan (EQ): Provided	EQ: (7) vs (4)	State-Regional Development (SRD): All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
(6) Provide Energy Industry Water Supply								
(a) Mines and Land Reclamation (ac-ft/yr)	0	7,448	7 448	4,060	3,388	1,216	6,232	0
(b) Coal Gasification (ac ft/yr)	0	10,000	10,000	0	10,000	0	10 000	0
(c) Electric Generation (ac-ft/yr)	0	0	0	0	0	0	0	0
(d) Slurry Pipeline (ac-ft/yr)	0	16,800	16,800	68,400	+51,600	0	16,800	0
(7) Production By Energy Industry								
(a) Electrical Generation Capacity (megawatts)	0	0	0	0	0	0	0	0
(b) Electrical Generation (gigawatts/hrs/yr)	0	0	0	0	0	0	0	0
(c) Syngas Production (MC f/d)	0	250	250	0	250	0	250	0
(8) Land Conservation (Acceleration) (M acres)	0	721	721	721	0	721	0	0
(9) Land Use Shift, Wildlife Agriculture to Recreation (acres)	136	0	136	0	136	136	0	136
(10) Hydroelectric Power Production								
(a) Electrical Generation Capacity (megawatts)	6	0	6	6	0	0	6	6
(b) Electrical Generation (gigawatts hrs yr)	21	0	21	21	0	0	21	21
E Total Plan (1,000 dollars)								
(1) Federal Cost	0	3,997	3,997	86,875	+82 878	1 630	2 367	0
(2) Nonfederal Cost	67 633	8,124	75,757	62 564	13,193	26 522	49 235	67 633
(3) Total Cost	67,633	12,121	79 754	149,439	+69,685	28 152	51 6[illegible]	67 633
(4) Associated Coal Industry Investment	0	(1,560,000)	(1,560,000)			(91 200)	(1 468,[illegible])	0
4 SOCIAL WELL-BEING, BENEFICIAL AND ADVERSE EFFECTS								
A Effects on Real Incomes								
(1) Increase Annual Income — Plan Components (M $)	2 265	2,915	5 180	5,615	+435	3 06[illegible]	[illegible]	[illegible]
(2) Increase Annual Income — Coal Industry (M $)	0	(39,510)	(39 510)	(62 415)	+(22 905)	(4 92[illegible])	(34 590)	0
(3) Increase Stabilize Redistribute Income — Plan Components (M $)	4 530	5,830	10,360	11 230	870	6 120	4 240	4 530
(4) Increase Stabilize Redistribute Income — Coal Industry (M $)	0	(79 020)	(79 020)	(124 830)	+(45 810)	(9 840)	69 180	0
B Security of Life Health and Safety								
(1) Provide Flood Protection Urban Area (acres M people)	0	1 300 9	1 300 9	1 300 9	0	0	[illegible]9	0
(2) Provide Flood Regulation by Reservoirs (M ac-ft)	0	0	0	250 000	+250,[illegible]	0	[illegible]	0
(3) Increased Air Pollution Within State Standards (X)	0	See Environmental Quality 2C				X		0
(4) Reduce ( ) Increase Water Pollution (X)		See Environmental Quality 2C						0
(5) Added Dependable Food Supplies (X)	X	0	X	X	0	0	X	[illegible]
(6) Added Energy Supplies (X)	0	X	X	X	0	0	X	X
(7) Population Impact — Plan Compoents (No)	615	780	1 395	1 555	+160	815	[illegible]	615
(8) Population Impact Coal Industry (No)	0	13,170	13 170	(20 805)	+(7 635)	(815)	(12 35[illegible])	0
C Educational Cultural and Recreational Opportunity								
(1) Added Hunting (hunting days)	0	0	0	0	0	0	0	0
(2) Added Fishing (fishing days)	10 000	0	10 000	21 500	+11 500	0	10,[illegible]	10,[illegible]
(3) Added Recreation (recreation days)	216 500	0	216 500	125 000	91 500	1[illegible]	44,[illegible]	216 [illegible]
(4) Added Social Health Educational Pressures Energy Related (X)	0	X	X	X	0	0	X	0

Table 73. Alternate Plan Capability — Lower Yellowstone

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit. Year 2000	Remaining Need Or Opportunity	Recommended Plan: Provided SRD	Recommended Plan: Provided NED EQ	Recommended Plan: Remaining Need	Alternative Plan Responses: NED Provides	NED Remaining	EQ Provides	EQ Remaining	SRD All Programs
Agriculture (Irrigation)												
a Low (3E)	Ac	426,000	214,000	212,000	31,575[8]	7,475[8]	172 950	12,606[8]	159,394	0	212,000	31,575[8]
b High (3E')	Ac	373,000	214,000	159,000	31,575[8]	7,475[8]	119,950	12,606[8]	106,394	0	159,000	31,575[8]
c Livestock (Beef, Hogs, Sheep)	M feed units E'	3,180	2,271	909	239	57	613	96	803	0	909	239
d Livestock Produced (Beef, Hogs, Sheep)	MM lbs E'	265	203	62	16	4	42	7	57	0	62	16
Municipal, Rural Domestic, and Livestock Water	Ac-ft Consumed	51,100	51,100	0	0	0	0	0	0	0	0	0
Nonenergy Industrial Water	AF Consumed	3,300	3,300	0	0	0	0	0	0	0	0	0
Energy Industry (Coal)												
a Coal Production — Low	M tons	500										
Coal Production — Most Probable	M tons	68,840										
Coal Production — High	M tons	230,100	176,000	(54,100)	0	(176,000)	(54,100)	(176,000)	(54 100)	(59,000)	(171,100)	0
b Thermal Elec Capacity — Low	Megawatts	50										
Thermal Elec Capacity — M Probable	Megawatts	50										
Thermal Elec Capacity — High	Megawatts	50	2,350	−(2,300)	0	(2,350)	(2,300)	(2,350)	(2,300)	(950)	(1400)	0
c Thermal Elec Production — Low	Gigawatts/hrs/yr	307										
Thermal Elec Production — M Probable	Gigawatts/hrs/yr	158										
Thermal Elec Production — High	Gigawatts/hrs/yr	158	14,405	−(14 247)	0	(14,405)	(14,247)	(14,405)	(14,247)	(5,915)	(8,490)	0
d Syngas Production — Low	MC fd	0		0								
Syngas Production — M Prob	MC fd	1,000		0								
Syngas Production — High	MC fd	1,500	0	(1,500)	0	0	(1,500)	0	(1,500)	0	(1,500)	0
e Water Consumed — Low	Ac-ft	822										
Water Consumed — M Prob	Ac-ft	46,689										
Water Consumed — High	Ac-ft	163,326	48,757	114,569	0	(48,757)	(114,569)	(85,826)	(77,500)	(20,740)	(142,586)	0
f Export-Rail/Slurry — High	M tons	173,000	167,000	6,000	0	(167,000)	(6,000)	(167,000)	(6,000)	(55,000)	(118,000)	0
Land Conservation Measures												
a Area Requiring Treatment	M Ac	6,253	2,647	3,606	0	1,803	1,803	1,803	1,803	1,803	1,803	0
b Capitalized Cost	M Dollars	124,999	51,746	73,253	0	36,670	36,583	36,670	36,583	36,670	36,583	0
Flood Control												
a Area Affected	M Ac	172	0	172	0	0	172	0	172	0	172	0
b Damage	M Dollars	1,413	0	1,413	0	0	1,413	0	1,413	0	1,413	0
Streambank Erosion												
a Affected	Bank miles				See figures/footnotes for Upper Yellowstone — Table 67							0
b Damage	M Dollars				See figures/footnotes for Upper Yellowstone — Table 67							0

[8] Full water supply

Table 73. Alternate Plan Capability — Lower Yellowstone

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit. Year 2000	Remaining Need Or Opportunity	Recommended Plan: Provided SRD	Recommended Plan: Provided NED/EQ	Recommended Plan: Remaining Need	Alternative Plan Responses NED: Provides	NED: Remaining	EQ: Provides	EQ: Remaining	SRD: All Programs
Fish and Wildlife												
a. Stream Fishing	Miles Lost to Reservoirs	—	—	—	0	0	—	0	—	0	—	0
b Lake Fishing (flat water)	M Acres	See	"Fishing" Days		0	0	—	0	—	0	—	0
c Habitat Protected	M Acres	NA	NA	NA	0	0	0	0	0	0	0	0
d Habitat Developed	M Acres	NA	NA	NA	0	0	0	0	0	0	0	0
e Fishing	Days	1,062,053[3]	688,926[3]	16,000[4]	0	0	16,000	0	16,000	0	16,000	0
Outdoor Recreation												
a Land Area	Acres	1,388	0	1,388	0	200	1,188	200	1,188	200	1,188	0
b Water Area	Acres	4,173	0	4,173	0	0	4,173	0	4,173	0	4 173	0
c Wild, Scenic, Recr'n Rivers	Miles	260	0	260	0	260	0	260	0	260	0	0
d Recreation	Days	893,043	0	893,043	0	780,000	113,043	780,000	113,043	780,000	113,043	0
Water Quality Control and Instream Flow												
a Point Sources	W Q Standards				Assume compliance with "Water Quality Standards" by 1985							
b Nonpoint Sources	W Q Standards				Assume continued effort but longer term attainment of goals							
Instream Flows	State Program				Seek adequate legislation, reservations, and adequate administration							
Hydroelectric Power												
a Electric Generating Capacity	Megawatts	0	0	0	0	0	0	0	0	0	0	0
b Electric Generation	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0

[3] Projected demand and "Without" supply for aggregate of Upper Yellowstone, Clarks Fork Bighorn, Tongue-Powder, and Lower Yellowstone Planning Areas

[4] About 5% of indicated "Remaining Need" assigned to Lower Yellowstone Planning Area

NA — Not available

Table 74. Comparison of Alternative Plans — Lower Yellowstone

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED EQ	Total	Provided	(5) vs. (4)	Provided	(7) vs. (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Thousand Dollars)							
1. **NATIONAL ECONOMIC DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS**[1]								
A. Value of Increased Outputs Goods/Services, and Value of Resources								
(1) Multipurpose[2]								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(2) Agriculture (Irrigation)								
Total Cost	41,998	9,221	51 219	15 991	35,228	0	51,219	41,998
Annual Cost	3,611	639	4 250	1 110	3 140	0	4 250	3 611
Annual Benefits	3,116	787	3 903	1,334	2,569	0	3,903	3 116
(3) Energy Industry (Coal)[3]								
Total Cost	0	(1,153,000)	(1,153 000)	(1 311 200)	(158 200)	(336,300)	(816,700)	0
Annual Cost	0	(659,000)	(659,000)	(657,290)	(1 710)	(330,540)	(328 460)	0
Annual Benefits	0	(775,000)	(775 000)	(772 970)	(2 030)	(388 730)	(386 270)	0
(4) Land Conservation Measures (Acceleration)								
Total Cost	0	36,670	36 670	36 670	0	36 670	0	0
Annual Cost	0	2,972	2 972	2 972	0	2 972	0	0
Annual Benefits	0	2,972	2 972	2,972	0	2,972	0	0
(5) Flood Control								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(6) Streambank Erosion								
Total Cost	0*	5,600*	5 600*	0	5 600*	0	5 600*	0
Annual Cost	0	430	430	0	430	0	430	0
Annual Benefits	0	NA	NA	0	NA	0	0	0
(7) Fish and Wildlife								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(8) Outdoor Recreation								
Total Cost	0	41,068	41,068	41,068	0	41,068	0	0
Annual Cost	0	3,636	3 636	3 636	0	3,636	0	0
Annual Benefits	0	4,056	4 056	4 056	0	4 056	0	0
(9) Hydroelectric Power								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(10) Municipal/Industrial Water Supply								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(11) Total Plan								
Total Cost	41,998	92,559	134 557	93 729	40,828	77,738	56,819	41,998
Annual Cost	3,611	7,677	11,288	7,718	3 570	6,608	4 680	3,611
Annual Benefits	3,116	7,815	10,931	8 362	2 569	7 028	3,903	3,116

[1] NED, EQ, and SRD Annual Benefits are Direct only. SRD includes other benefits in R D Account only
[2] Costs and benefits allocated to respective functions
[3] Energy Industry figures ( ) are not included in Total Plan
* $5,600,000 is cost of work contemplated @ 24 locations — Yellowstone River — Streambank Erosion Control and Demonstration Act of 1974 as amended by Water Resource Development Act of 1976

Table 74. Comparison of Alternative Plans — Lower Yellowstone

Account and Component (1)	Recommended Plan (RP) Provided: SRD (2)	Recommended Plan (RP) Provided: NED EQ (3)	Total (4)	National Economic Development Plan (NED): Provided (5)	NED: (5) vs (4) (6)	Environmental Quality Plan (EQ): Provided (7)	EQ: (7) vs (4) (8)	State-Regional Development (SRD): All Programs (9)
	(Units As Shown)							
2. ENVIRONMENTAL QUALITY, BENEFICIAL AND ADVERSE EFFECTS								
A. Open/Green Spaces, Wild Scenic Recreational Rivers, Lakes and Areas of Natural Beauty								
(1) Create Lakes (surface acres)	0	0	0	0	0	0	[illegible]	[illegible]
(2) Develop Greenbelts (X)	0	X	X	0	X	X	[illegible]	[illegible]
(3) Convert Agricultural Other Lands to Wildlife Refuge (acres)	0	0	0	0	0	0	[illegible]	[illegible]
(4) Land Conversion to Recreation Areas (acres)	0	200	200	200	0	200	[illegible]	[illegible]
(5) Wild Scenic Recreation Rivers (miles)	0	260	260	260	0	260	[illegible]	[illegible]
(6) Wild Scenic Recreation Rivers (easement acres)	0	57,200	57,200	[illegible]	0	57,200	[illegible]	[illegible]
B. Archaeological, Historical, Biological, and Geological Resources, Selected Ecological Systems								
(1) Preserve Woodlands (acres)	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(2) Preserve Unique Areas (acres)	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(3) Preserve Add Wildlife Habitat (acres)	0	See Greenbelts	[illegible]	[illegible]	[illegible]	See Greenbelts	[illegible]	[illegible]
(4) Improve Wildlife Habitat (acres)	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(5) Lose Stream Fishery (miles)	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(6) Add Lake Reservoir Fishery [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(7) Adopt Adequate Instream Flow Levels (X)	Areawide	Areawide	X	[illegible]	X	Areawide	[illegible]	[illegible]
C. Quality of Water, Air, and Land Resources								
(1) Accelerated Land Treatment (M acres)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(2) Reduction of Soil Loss Sediment Yield Nutrients (X)	[illegible]	X	[illegible]	X	[illegible]	X	[illegible]	[illegible]
(3) Improve Water Quality by Low Streamflow Augmentation (miles)	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(4) Area Affected by Strip Mining (average M acres year)[a]	[illegible]	[illegible]534	[illegible]534	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(5) Streamflow Degradation — Chemical Content of Return Flows (X)	X	X	X	X	[illegible]	[illegible]	X	[illegible]
(6) Air Pollutant Emissions — Particulate (tons year)	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(7) Air Pollutant Emissions — Sulfur Oxides (tons year)	0	86,400	86,400	86,[illegible]	[illegible]	[illegible]	[illegible]444	[illegible]
(8) Air Pollutant Emissions — Nitrogen Oxides (tons year)	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4,[illegible]	[illegible]
D. Irreversible Commitment of Resources to Future Uses								
(1) Conversion of Agricultural Land, Terrestrial Habitat, etc. to Reservoirs (acres)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(2) Conversion — Agricultural Land to Energy Plant Sites (acres)	[illegible]	7,630	6,[illegible]	4,9[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(3) Streamflow Depletion — Added Irrigation (ac ft)	6[illegible]	15,[illegible]	82,600	26,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(4) Streamflow Depletion — Added Energy Industry Coal (ac ft)	[illegible]	48,[illegible]	48,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(5) Streamflow Depletion — Slurry Line Transport of Coal (ac ft)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(6) Streamflow Depletion — Municipal Industrial Water Supply (ac ft)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[a] Five to 25 year lag to attain full productivity through land [illegible].

Table 74. Comparison of Alternative Plans — Lower Yellowstone

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. REGIONAL DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS	(Thousand Dollars)							
A Value to Users of Increased Goods/Services — Study Area Residents								
(1) Agriculture (Irrigation)	5,995	787	6,782	1,334	5,448	0	6,782	5,995
(2) Energy Industry — Coal	0	(775,000)	(775,000)	(772,970)	(2,030)	(388,730)	(386,270)	0
(3) Land Conservation Measures — Accelerated	0	2,972	2,972	2,972	0	2,972	0	0
(4) Flood Control	0	0	0	0	0	0	0	0
(5) Streambank Erosion	0	0	0	0	0	0	0	0
(6) Fish and Wildlife	0	0	0	0	0	0	0	0
(7) Outdoor Recreation	0	4,056	4,056	4,056	0	4,056	0	0
(8) Hydroelectric Power	0	0	0	0	0	0	0	0
(9) Municipal/Industrial Water Supply	0	0	0	0	0	0	0	0
(10) Total Plan	5,995	7,815	13,810	8,362	5,448	7,028	6,782	5,995
B Additional Income Accruing to Residents								
(1) Agriculture (Irrigation)	3,390	855	4 245	1 425	2,820	0	4,245	3,390
(2) Energy Industry — Coal	0	(58,695)	(58,695)	(58,695)	0	(19,995)	(38,700)	0
(3) Land Conservaton Measures — Accelerated	0	11,270	11,270	11,270	0	11,270	0	0
(4) Flood Control	0	0	0	0	0	0	0	0
(5) Fish and Wildlife	0	0	0	0	0	0	0	0
(6) Outdoor Recreation	0	360	360	360	0	360	0	0
(7) Hydroelectric Power	0	0	0	0	0	0	0	0
(8) Municipal/Industrial Water Supply	0	0	0	0	0	0	0	0
(9) Total Plan	3,390	12,485	15,875	13 055	2,820	11,630	4,245	3,390
C Net Beneficial Employment — Number of Jobs — Permanent Direct	(Units As Shown)							
(1) Agriculture (Irrigation)	226	57	283	321	+38	0	283	226
(2) Energy Industry — Coal	0	(3,913)	(3,913)	(3,913)	0	(1,333)	(2,580)	0
(3) Land Conservation	0	600	600	600	0	600	0	0
(4) Flood Control	0	0	0	0	0	0	0	0
(5) Fish and Wildlife	0	0	0	0	0	0	0	0
(6) Outdoor Recreation	0	18	18	18	0	18	0	0
(7) Hydroelectric Power	0	0	0	0	0	0	0	0
(8) Municipal/Industrial Water Supply	0	0	0	0	0	0	0	0
(9) Total	226	675	901	939	+38	618	283	226
D Regional Economic Base and Stability — To Year 2000								
(1) Convert Dry Land to Irrigated Agriculture (acres)	31,575	7,475	39,050	12,606	26,444	0	39,050	31,575
(2) Improve Irrigation Systems (acres)	0	0	0	0	0	0	0	0
(3) Provide Supplemental Irrigation Water Supply (acres)	0	0	0	0	0	0	0	0
(4) Provide Municipal/Industrial Water (ac-ft)	0	0	0	0	0	0	0	0
(5) Provide Coal for Regional/National Needs								
(a) Transport By Rail (M tons/year)	0	167,000	167,000	105,000	62,000	55,000	112,000	0
(b) Transport by Slurry Pipeline (M tons/year)	0	0	0	62,000	+62,000	0	0	0
(c) Convert to Electricity in Study Area (M tons/year)	0	9,000	9,000	9,000	0	4,000	−5,000	0
(d) Convert to Gas in Study Area (M tons/year)	0	0	0	0	0	0	0	0

Table 74. Comparison of Alternative Plans — Lower Yellowstone

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
(6) Provide Energy Industry Water Supply								
(a) Mines and Land Reclamation (ac ft/yr)	0	13,376	13,376	13,376	0	6,490	6,886	0
(b) Coal Gasification (ac-ft/yr)	0	0	0	0	0	0	0	0
(c) Electric Generation (ac ft/yr)	0	35,381	35,381	35,250	131	14 250	21 131	0
(d) Slurry Pipeline (ac-ft/yr)	0	0	0	37,200	(37,200	0	0	0
(7) Production By Energy Industry								
(a) Electrical Generation Capacity (megawatts)	0	2,350	2,350	2,350	0	950	1 400	0
(b) Electrical Generation (gigawatts/hrs yr)	0	14,405	14,405	14,405	0	5,915	8 490	0
(c) Syngas Production (MC f/d)	0	0	0	0	0	0	0	0
(8) Land Conservation (Acceleration) (M acres)	0	1,803	1,803	1,803	0	1 803	0	0
(9) Land Use Shift Wildlife Agriculture to Recreation (acres)	0	200	200	200	0	200	0	0
(10) Hydroelectric Power Production								
(a) Electrical Generation Capacity (megawatts)	0	0	0	0	0	0	0	0
(b) Electrical Generation (gigawatts/hrs/yr)	0	0	0	0	0	0	0	0
E Total Plan (1,000 dollars)								
(1) Federal Cost	0	54 099	54 099	51,884	2 215	43 888	10,211	0
(2) Nonfederal Cost	41 998	38,460	80,458	41 845	38 613	33 850	46 60[illegible]	11 998
(3) Total Cost	41 998	92 559	134 557	93,729	40,828	77,738	56 819	11 998
(4) Associated Coal Industry Investment	0	(1,153,000)	(1,153,000)	(1 311,200)	(158 200)	(336 300)	(816 [illegible])	0
4 SOCIAL WELL-BEING, BENEFICIAL AND ADVERSE EFFECTS								
A Effects on Real Incomes								
(1) Increase Annual Income — Plan Components (M $)	3 390	12 485	15 875	13 055	2 820	11 630	4 245	[illegible]
(2) Increase Annual Income — Coal Industry (M $)	0	(58,695)	(58,695)	(58 695)	0	19 995	(35 7[illegible])	0
(3) Increase Stabilize Redistribute Income — Plan Components (M $)	6 780	(24,970)	(31 750)	(26 110)	5 640	(23 260)	8 490	6 [illegible]
(4) Increase Stabilize Redistribute Income — Coal Industry (M $)	0	(117 390)	(117 390)	(117 390)	[illegible]	(19 990)	[illegible]	[illegible]
B Security of Life Health and Safety								
(1) Provide Flood Protection Urban Area (acres M people)	0	0	0	0	0	0	0	0
(2) Provide Flood Regulation by Reservoirs (M ac ft)	0	0	0	0	0	0	[illegible]	[illegible]
(3) Increased Air Pollution Within State Standards (X)			See Environmental Quality [illegible]					
(4) Reduce ( ) Increase Water Pollution (X)			See Environmental Quality [illegible]					
(5) Added Dependable Food Supplies (X)	X	X	X	X	0	0	X	X
(6) Added Energy Supplies (X)	0	X	X	X	0	0	X	[illegible]
(7) Population Impact — Plan Compoents (No)	1 130	3 375	4 505	4 695	190	[illegible]	[illegible]	[illegible]
(8) Population Impact Coal Industry (No)	0	(19 565)	(19 565)	(19 565)	[illegible]	(6 6[illegible])	(1[illegible])	[illegible]
C Educational Cultural and Recreational Opportunity								
(1) Added Hunting (hunting days)	0	0	0	0	0	0	0	[illegible]
(2) Added Fishing (fishing days)	0	0	0	0	0	0	0	[illegible]
(3) Added Recreation (recreation days)	0	780 000	780 000	780 000	0	780 000	[illegible]	[illegible]
(4) Added Social Health Educational Pressures Energy Related (X)	0	X	X	X	0	[illegible]	X	[illegible]

Table 75. Alternate Plan Capability — North Dakota Tributaries

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit Year 2000	Remaining Need Or Opportunity	Recommended Plan			Alternative Plan Responses				
					Provided SRD	Provided NED/EO	Remaining Need	NED Provides	NED Remaining	EO Provides	EO Remaining	SRD All Programs
Agriculture (Irrigation)												
a Low (3E)	Ac	148,215	135,000	13,215	0	0	13,215	12,400[8]	815	0	13,215	
b High (3E')	Ac	412,995	135,000	277,995	0	0	277,995	12,400[8]	265,595	0	277 995	38,620[8]
c Livestock (Beef, Hogs, Sheep)	M feed units E'	7,539	6,581	958	0	0	958	43	915	0	958	132
d Livestock Produced (Beef, Hogs, Sheep)	MM lbs E'	583	504	79	0	0	79	4	75	0	79	11
Municipal, Rural Domestic, and Livestock Water	Ac-ft Consumed	116,800	71,800	(45,000)		See Municipal/Industrial Water Supply						
Nonenergy Industrial Water	AF Consumed	52	52	0	0	0	0	0	0	0	0	0
Energy Industry (Coal)												
a Coal Production — Low	M tons	11,000				—		—				
Coal Production — Most Probable	M tons	112,360				—		—				
Coal Production — High	M tons	158,260	158,260	0	0	(36,000)	(122,260)	(164,880)	(6,620)	(19 000)	(139 260)	0
b Thermal Elec Capacity — Low	Megawatts	1,222										
Thermal Elec Capacity — M Probable	Megawatts	9,182										
Thermal Elec Capacity — High	Megawatts	8,873	8,873	0	0	(3 834)	(5,039)	(8,873)	0	(2 499)	(6,374)	0
c Thermal Elec Production — Low	Gigawatts/hrs/yr	7,493										
Thermal Elec Production — M Probable	Gigawatts/hrs/yr	41,766										
Thermal Elec Production — High	Gigawatts/hrs/yr	40,806	40,806	0	0	(23,510)	(17,296)	(40,806)	0	(15,342)	(25,464)	0
d Syngas Production — Low	MC fd	0										
Syngas Production — M Prob	MC fd	2,024										
Syngas Production — High	MC fd	2,524	2,524	0	0	(250)	(2,274)	0	(2,524)	0	(2,524)	0
e Water Consumed — Low	Ac-ft	20,592										
Water Consumed — M Prob	Ac-ft	203,872										
Water Consumed — High	Ac-ft	224,779	224,779	0	0	(74,744)	(150,035)	(210,628)	(14,151)	(41 568)	(183,211)	0
f Export-Rail/Slurry — High	M tons	25,600	5,500	(20,100)	0	(2,500)	(23,100)	(136,540)	(110,940)	0	(26,500)	0
Land Conservation Measures												
a Area Requiring Treatment	M Ac	5,772	2,163	3,609	0	1,806	1,804	1,806	1 804	1,806	1,804	0
b Capitalized Cost	M Dollars	170,614	69,230	101 384	0	51,911	49,473	51,911	49,473	51,911	49,473	0
Flood Control												
a Area Affected	M Ac	415	0	415	0	10	405	66	349	0	415	0
b Damage	M Dollars	3,483	0	3,483	0	40	3,443	318	3,165	0	3,483	0
Streambank Erosion												
a Affected	Bank miles	658	0	658	0	1	657	0	658	1	657	0
b Damage	M Dollars	481	0	481	0	105	376	0	481	105	376	0

[8] Full water supply

Table 75. Alternate Plan Capability — North Dakota Tributaries

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit Year 2000	Remaining Need Or Opportunity	Recommended Plan: Provided SRD	Recommended Plan: Provided NED/EO	Recommended Plan: Remaining Need	Alternative Plan Responses NED: Provides	NED: Remaining	EO: Provides	EO: Remaining	SRD: All Programs
Fish and Wildlife												
a Stream Fishing	Miles Lost to Reservoirs	—	—		0	0	—	40	—	0		40
b Lake Fishing (flat water)	M Acres	NA	NA	NA	0	0	—	7 300	—	0	—	7 300
c Habitat Protected	M Acres	NA	NA	NA	0	78,553	NA	16,500	NA	80,973	NA	[illegible]
d Habitat Developed	M Acres	NA	NA	NA	0	0		0		0		
e Fishing	Days	NA	NA	NA	0	0	NA	14,200	NA	0	NA	[illegible]
Outdoor Recreation												
a Land Area	Acres	194	0	194	0	244	50	304	110	244	[illegible]	[illegible]
b Water Area	Acres	29	0	29	0	0	29	10 900	10,871	0	29	[illegible]
c Wild Scenic, Recr n Rivers	Miles	335	0	335	249	75	11	75	260	335	0	249
d Recreation	Days	624,300	0	624,300	384,500	210,000	29,800	232 000	392 300	624 300	0	[illegible]
e Woodland Preservation	Acres	11,114	0	11,114	0	11,114	0	0	11 114	11 114	[illegible]	[illegible]
Water Quality Control and Instream Flow												
a Point Sources	W Q Standards				Assume compliance with Water Quality Standards by 1985							
b Nonpoint Sources	W Q Standards				Assume continued effort but longer term attainment of goals							
Instream Flows	State Program				Seek adequate legislation reservations and adequate administration							
Hydroelectric Power												
a Electric Generating Capacity	Megawatts	272	0	272	0	272	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
b Electric Generation	Gigawatts hrs yr		Large need for peaking						Largely peaking power			
Municipal Industrial Water Supply	Acre Feet	—	—	45 000	0	0	45 000	45 000	0	0	[illegible]	[illegible]

NA — Not available

Table 76. Comparison of Alternative Plans — North Dakota Tributaries

Account and Component	Recommended Plan (RP) Provided: SRD	Recommended Plan (RP) Provided: NED/EQ	Recommended Plan (RP) Provided: Total	National Economic Development Plan (NED): Provided	National Economic Development Plan (NED): (5) vs (4)	Environmental Quality Plan (EQ): Provided	Environmental Quality Plan (EQ): (7) vs (4)	State-Regional Development (SRD): All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Thousand Dollars)							
1. NATIONAL ECONOMIC DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS[1]								
A Value of Increased Outputs/Goods/Services, and Value of Resources								
(1) Multipurpose[2]								
Total Cost	0	0	0	70,578	+70,578	0	0	0
Annual Cost	0	0	0	5,785	+5,585	0	0	0
Annual Benefits	0	0	0	10,319	+10,319	0	0	0
(2) Agriculture (Irrigation)								
Total Cost	0	0	0	17,272	+17,272	0	0	168,049
Annual Cost	0	0	0	849	+849	0	0	12,066
Annual Benefits	0	0	0	1,352	+1,352	0	0	6,108
(3) Energy Industry (Coal)[3]								
Total Cost	0	(1,641,000)	(1,641,000)	(3,770,000)	+(2,129,000)	(529,000)	−(1,112,000)	0
Annual Cost	0	(277,310)	(277,310)	(497,240)	+(219,930)	(154,420)	−(122,890)	0
Annual Benefits	0	(311,800)	(311,800)	(584,500)	+(272,700)	(181,500)	−(130,300)	0
(4) Land Conservation Measures (Acceleration)								
Total Cost	0	51,911	51,911	51,911	0	51,911	0	0
Annual Cost	0	4,126	4,126	4,126	0	4,126	0	0
Annual Benefits	0	4,126	4,126	4,126	0	4,126	0	0
(5) Flood Control								
Total Cost	0	160	160	1,814	+1,654	0	160	2,215
Annual Cost	0	17	17	146	+129	0	−17	153
Annual Benefits	0	40	40	318	+278	0	40	112
(6) Streambank Erosion								
Total Cost	0*	7,260*	7,260*	0	7,260*	105	7,155*	0
Annual Cost	0	545	545	0	545	7	538	0
Annual Benefits	0	NA	NA	0	NA	0	NA	0
(7) Fish and Wildlife								
Total Cost	0	0	0	614	+614	0	0	0
Annual Cost	0	0	0	46	+46	0	0	0
Annual Benefits	0	0	0	90	+90	0	0	0
(8) Outdoor Recreation								
Total Cost	39,476	12,111	51,587	12,251	39,336	53,281	+1,694	39,476
Annual Cost	3,418	1,129	4,547	1,138	3,409	4,690	+143	3,418
Annual Benefits	1,245	1,257	2,502	1,286	−1,216	2,684	+182	1,245
(9) Hydroelectric Power								
Total Cost	0	90,748	90,748	90,748	0	0	90,748	0
Annual Cost	0	6,070	6,070	6,070	0	0	−6,070	0
Annual Benefits	0	9,604	9,604	9,604	0	0	−9,604	0
(10) Municipal/Industrial Water Supply								
Total Cost	0	0	0	50,593	+50,593	0	0	0
Annual Cost	0	0	0	4,732	+4,732	0	0	0
Annual Benefits	0	0	0	8,550	+8,550	0	0	0
(11) Total Plan								
Total Cost	39,476	162,190	201,666	225,203	+23,537	105,297	−96,369	209,740
Annual Cost	3,418	11,887	15,305	17,107	+1,802	8,823	−6,482	15,637
Annual Benefits	1,245	15,027	16,272	25,326	+8,432	6,810	9,462	7,465

[1] NED, EQ, and SRD "Annual Benefits" are "Direct" only. SRD includes other benefits in R D Account only
[2] Costs and benefits allocated to respective functions
[3] Energy Industry figures ( ) are not included in "Total Plan"
* 7155 is cost of streambank protection at 21 locations on Missouri River, "Streambank Erosion Control and Demonstration Act of 1974 as amended by Water Resources Development Act of 1976"

Table 78. Comparison of Alternative Plans — Wind-Bighorn-Clarks Fork

Account and Component	Recommended Plan (RP) Provided SRD	Recommended Plan (RP) Provided NED/EQ	Recommended Plan (RP) Total	National Economic Development Plan (NED) Provided	National Economic Development Plan (NED) (5) vs (4)	Environmental Quality Plan (EQ) Provided	Environmental Quality Plan (EQ) (7) vs (4)	State-Regional Development (SRD) All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. REGIONAL DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS				(Thousand Dollars)				
A Value to Users of Increased Goods/Services — Study Area Residents								
(1) Agriculture (Irrigation)	22,271	4,043	26,314	7,405	−18,909	0	−26,314	35,977
(2) Energy Industry — Coal	0	0	0	0	0	0	0	0
(3) Land Conservation Measures — Accelerated	0	2,956	2,956	2,956	0	2,956	0	0
(4) Flood Control	0	97	97	103	+6	0	97	0
(5) Streambank Erosion	0	0	0	0	0	0	0	0
(6) Fish and Wildlife	215	21	236	137	−99	119	117	289
(7) Outdoor Recreation	844	2,031	2,875	689	−2,186	2,486	389	441
(8) Hydroelectric Power	2,335	0	2,335	1,152	1,183	0	2,335	2,335
(9) Municipal/Industrial Water Supply	1,817	0	1,817	899	−918	0	−1,817	1,817
(10) Total Plan	27,482	9,148	36,630	13,391	23,289	5,561	31,069	40,859
B Additional Income Accruing to Residents								
(1) Agriculture (Irrigation)	9,420	4,695	14,115	5,400	8,715	0	14 115	17 400
(2) Energy Industry — Coal	0	0	0	0	0	0	0	0
(3) Land Conservaton Measures — Accelerated	0	8,700	8,700	8,700	0	8,700	0	0
(4) Flood Control	0	60	60	60	0	0	60	0
(5) Fish and Wildlife	15	30	45	255	+210	120	+75	15
(6) Outdoor Recreation	20	500	520	320	200	800	+280	20
(7) Hydroelectric Power	240	0	240	240	0	0	240	240
(8) Municipal Industrial Water Supply	240	0	240	240	0	45	195	240
(9) Total Plan	9,935	13,985	23,920	15,215	8,705	9,665	14,255	17 915
				(Units As Shown)				
C Net Beneficial Employment — Number of Jobs — Permanent Direct								
(1) Agriculture (Irrigation)	628	313	941	360	581	0	941	1 116
(2) Energy Industry — Coal	0	0	0	0	0	0	0	0
(3) Land Conservation	0	580	580	580	0	580	0	0
(4) Flood Control	0	4	4	4	0	0	4	0
(5) Fish and Wildlife	1	2	3	17	+14	8	+5	1
(6) Outdoor Recreation	1	25	26	16	−10	40	+14	1
(7) Hydroelectric Power	8	0	8	8	0	0	8	8
(8) Municipal Industrial Water Supply	16	0	16	16	0	3	13	16
(9) Total	654	924	1,578	1,001	577	631	947	1 142
D Regional Economic Base and Stability — To Year 2000								
(1) Convert Dry Land to Irrigated Agriculture (acres)	89 280	32,957	122,237	60,197	62,040	0	122,237	136 630
(2) Improve Irrigation Systems (acres)	0	38 752	38,752	38,752	0	0	38 752	0
(3) Provide Supplemental Irrigation Water Supply (acres)	0	17 301	17,301	19 001	+1 700	0	17 301	0
(4) Provide Municipal-Industrial Water (ac-ft)	5,000	0	5,000	5,000	0	0	5 000	5 000
(5) Provide Coal for Regional National Needs								
(a) Transport By Rail (M tons/year)	0	0	0	0	0	0	0	0
(b) Transport by Slurry Pipeline (M tons/year)	0	0	0	0	0	0	0	0
(c) Convert to Electricity in Study Area (M tons/year)	0	0	0	0	0	0	0	0
(d) Convert to Gas in Study Area (M tons/year)	0	0	0	0	0	0	0	0

Table 76. Comparison of Alternative Plans — North Dakota Tributaries

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs. (4)	Provided	(7) vs. (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. REGIONAL DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS	(Thousand Dollars)							
A Value to Users of Increased Goods/Services — Study Area Residents								
(1) Agriculture (Irrigation)	0	0	0	1,352	+1 352	0	0	15,955
(2) Energy Industry — Coal	0	(311,800)	(311,800)	(584,500)	+(272,700)	(181 500)	(130,300)	0
(3) Land Conservation Measures — Accelerated	0	4,126	4,126	4,126	0	4 126	0	0
(4) Flood Control	0	40	40	318	+278	0	40	179
(5) Streambank Erosion[10]	0	NA	NA	0	0	0	0	0
(6) Fish and Wildlife	0	0	0	90	+90	0	0	0
(7) Outdoor Recreation	1,867	1,257	3,124	1,286	1,838	2,684	440	1,867
(8) Hydroelectric Power	0	9,604	9 604	9,604	0	0	9,604	0
(9) Municipal/Industrial Water Supply	0	0	0	8,550	+8,550	0	0	0
(10) Total Plan	1,867	15,027	16,894	25,326	+8,432	6,810	−10,084	18,001
B Additional Income Accruing to Residents								
(1) Agriculture (Irrigation)	0	0	0	1,275	+1,275	0	0	7,255
(2) Energy Industry — Coal	0	(29,805)	(29,805)	(75,870)	+(46,065)	(4,740)	−(25,065)	0
(3) Land Conservation Measures — Accelerated	0	12,370	12,370	12,370	0	12,370	0	0
(4) Flood Control	0	30	30	90	+60	0	−30	0
(5) Fish and Wildlife	0	0	0	30	+30	0	0	0
(6) Outdoor Recreation	380	200	580	140	440	580	0	380
(7) Hydroelectric Power	0	420	420	420	0	0	−420	0
(8) Municipal/Industrial Water Supply	0	0	0	105	+105	0	0	0
(9) Total Plan	380	13,020	13,400	14,430	1,030	12,950	−450	7,640
C Net Beneficial Employment — Number of Jobs — Permanent Direct	(Units As Shown)							
(1) Agriculture (Irrigation)	0	0	0	85	+85	0	0	484
(2) Energy Industry — Coal	0	(1,987)	(1,987)	(5,058)	+(3,071)	(316)	(1,671)	0
(3) Land Conservation	0	825	825	825	0	825	0	0
(4) Flood Control	0	2	2	6	+4	0	−2	0
(5) Fish and Wildlife	0	0	0	2	+2	0	0	0
(6) Outdoor Recreation	19	10	29	7	22	29	0	19
(7) Hydroelectric Power	0	14	14	14	0	0	−14	0
(8) Municipal/Industrial Water Supply	0	0	0	12	+12	0	0	0
(9) Total	19	851	870	951	+81	854	−16	503
D. Regional Economic Base and Stability — To Year 2000								
(1) Convert Dry Land to Irrigated Agriculture (acres)	0	0	0	12,400	+12,400	0	0	38 620
(2) Improve Irrigation Systems (acres)	0	0	0	0	0	0	0	0
(3) Provide Supplemental Irrigation Water Supply (acres)	0	0	0	0	0	0	0	0
(4) Provide Municipal/Industrial Water (ac-ft)	0	0	0	45,000	+45,000	0	0	0
(5) Provide Coal for Regional/National Needs								
(a) Transport By Rail (M tons/year)	0	2,500	2,500	136,540	+134,040	0	−2,500	0
(b) Transport by Slurry Pipeline (M tons/year)	0	0	0	0	0	0	0	0
(c) Convert to Electricity in Study Area (M tons/year)	0	21,500	21,500	28,340	+6,840	19,000	−2,500	0
(d) Convert to Gas in Study Area (M tons/year)	0	12,000	12,000	0	12,000	0	−12,000	0

[10] (Streambank Erosion Control and Demonstration Act work)

Table 76. Comparison of Alternative Plans — North Dakota Tributaries

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
(6) Provide Energy Industry Water Supply								
(a) Mines and Land Reclamation (ac-ft/yr)	0	6,084	6 084	27 866	+21 782	3,211	2,873	[illegible]
(b) Coal Gasification (ac-ft/yr)	0	10,000	10,000	0	10,000	0	10 [illegible]	[illegible]
(c) Electric Generation (ac-ft/yr)	0	58,660	58,660	102 015	+43,355	38 357	20 303	[illegible]
(d) Slurry Pipeline (ac-ft/yr)	0	0	0	80 748	+80 748	0	[illegible]	[illegible]
(7) Production By Energy Industry								
(a) Electrical Generation Capacity (megawatts)	0	3,834	3 834	8,873	+5 039	2 499	1 335	[illegible]
(b) Electrical Generation (gigawatts hrs/yr)	0	23,510	23,510	40,806	+17 296	15 342	[illegible]	[illegible]
(c) Syngas Production (MC f/d)	0	250	250	0	250	[illegible]	[illegible]	[illegible]
(8) Land Conservation (Acceleration) (M acres)	0	1,806	1,806	1,806	0	1 806	[illegible]	[illegible]
(9) Land Use Shift Wildlife Agriculture to Recreation (acres)	0	244	244	304	+60	244	[illegible]	[illegible]
(10) Hydroelectric Power Production								
(a) Electrical Generation Capacity (megawatts)	0	272	272	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(b) Electrical Generation (gigawatts hrs yr)	0	*	0*	*Largely peaking power		[illegible]		
E Total Plan (1 000 dollars)								
(1) Federal Cost	0	111 440	111 440	115 224	[illegible]	4 83[illegible]	106 6[illegible]	
(2) Nonfederal Cost	39.476	50.750	90.226	109.979	+19 [illegible]	100 46[illegible]	+10 236	[illegible]
(3) Total Cost	39 476	162.190	201.666	225.203	23 537	10[illegible] 29[illegible]	96 369	[illegible]
(4) Associated Coal Industry Investment	0	(1 641 000)	(1 641 000)	(3 770 000)	(2 129 000)	[illegible]	[illegible]	
4 SOCIAL WELL-BEING, BENEFICIAL AND ADVERSE EFFECTS								
A Effects on Real Incomes								
(1) Increase Annual Income — Plan Components (M $)	380	13.020	13,400	14 430	+1 030	12 950	45[illegible]	[illegible] 640
(2) Increase Annual Income — Coal Industry (M $)	0	(29 805)	(29.805)	(75 870)	+(46 065)	(4 740)	25 065	[illegible]
(3) Increase Stabilize Redistribute Income — Plan Components (M $)	760	26.040	26 800	28 860	+2 060	25 900	90[illegible]	[illegible]
(4) Increase Stabilize Redistribute Income — Coal Industry (M $)	0	59 610	(59 610)	(151 740)	+92 [illegible]	[illegible]	[illegible]	[illegible]
B Security of Life Health and Safety								
(1) Provide Flood Protection Urban Area (acres M people)	0	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(2) Provide Flood Regulation by Reservoirs (M ac ft)	0	[illegible]	[illegible]	41 [illegible]	+41 [illegible]	[illegible]	[illegible]	[illegible]
(3) Increased Air Pollution Within State Standards (X)	0	See Environmental Quality [illegible]				X		
(4) Reduce [illegible] Increase Water Pollution (X)		See Environmental Quality [illegible]						
(5) Added Dependable Food Supplies (X)	0	0	[illegible]	X	X		[illegible]	[illegible]
(6) Added Energy Supplies (X)	0	X	X	X	[illegible]	[illegible]	X	[illegible]
(7) Population Impact — Plan Components (No)	95	4 255	4 350	4 755	+405	4 [illegible]	8[illegible]	[illegible]
(8) Population Impact Coal Industry (No)	0	(9 935)	(9 935)	(25 290)	(15 355)	[illegible]	[illegible]	[illegible]
C Educational Cultural and Recreational Opportunity								
(1) Added Hunting (hunting days)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(2) Added Fishing (fishing days)	[illegible]	[illegible]	[illegible]	14 [illegible]	14 [illegible]	[illegible]	[illegible]	[illegible]
(3) Added Recreation (recreation days)	384 500	210 [illegible]	[illegible]94 500	[illegible]	[illegible]	[illegible]	+29 809	384 500
(4) Added Social Health Educational Pressures Energy Related (X)	[illegible]	X	[illegible]	X	[illegible]	[illegible]	[illegible]	[illegible]

Table 77. Alternate Plan Capability — Wind-Bighorn-Clarks Fork

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit. Year 2000	Remaining Need Or Opportunity	Recommended Plan			Alternative Plan Responses				
					Provided SRD	Provided NED/EQ	Remaining Need	NED Provides	NED Remaining	EQ Provides	EQ Remaining	SRD All Programs
Agriculture (Irrigation)												
a Low (3E)	Ac	307,000	347,000	-40,000	—	(17,301)[7]	-162,237[8]	(19,001[7])	-99,197	0	39,000	
b High (3E') . . .	Ac	347,000	347,000	0	89,280[8]	32,957[8]	-122,237[8]	60,197[8]	-60,197	0	0	136,630
c Livestock (Beef, Hogs, Sheep)	M feed units E'	1,540	2,000	460	516	190	-1,166	348	-808	0	-460	790
d Livestock Produced (Beef, Hogs, Sheep)	MM lbs E'	125	131	-6	34	12	-52	23	-29	0	-6	52
Municipal, Rural Domestic, and Livestock Water	Ac-ft Consumed	26,400	26,400	0	0	0	0	0	0	0	0	0
Nonenergy Industrial Water	AF Consumed	6,000	6,000	0	0	0	0	0	0	0	0	0
Energy Industry (Coal)												
a Coal Production — Low	M tons	0	0	0	0	0	0	0	0	0	0	0
Coal Production — Most Probable . . .	M tons	0	0	0	0	0	0	0	0	0	0	0
Coal Production — High	M tons	0	0	0	0	0	0	0	0	0	0	0
b Thermal Elec. Capacity — Low	Megawatts	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Capacity — M Probable	Megawatts	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec. Capacity — High	Megawatts	0	0	0	0	0	0	0	0	0	0	0
c Thermal Elec. Production — Low	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec Production — M. Probable	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
Thermal Elec. Production — High	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
d Syngas Production — Low	MC fd	0	0	0	0	0	0	0	0	0	0	0
Syngas Production — M Prob.	MC fd	0	0	0	0	0	0	0	0	0	0	0
Syngas Production — High	MC fd	0	0	0	0	0	0	0	0	0	0	0
e Water Consumed — Low	Ac-ft	0	0	0	0	0	0	0	0	0	0	0
Water Consumed — M Prob	Ac-ft	0	0	0	0	0	0	0	0	0	0	0
Water Consumed — High	Ac-ft	0	0	0	0	0	0	0	0	0	0	0
f Export-Rail/Slurry — High	M tons	0	0	0	0	0	0	0	0	0	0	0
Land Conservation Measures												
a Area Requiring Treatment	M Ac	5,558	1,576	3,982	0	1,994	1,988	1,994	1,988	1,994	1,988	0
b Capitalized Cost	M Dollars	102,354	33,366	68,988	0	36,474	32,514	36,474	32,514	36,474	32,514	0
Flood Control												
a Area Affected	M Ac	133	0	133	0	11	122	11	122	0	133	0
b Damage	M Dollars	1,753	0	1,753	0	97	1,656	103	1,650	0	1,753	0
Streambank Erosion												
a Affected	Bank miles	2,202	0	2,202	0	20	2,182	20	2,182	0	2,202	0
b. Damage	M Dollars	613	0	613	0	8	605	8	605	0	613	0

[7] Supplemental water supply
[8] Full water supply

Table 77. Alternate Plan Capability — Wind-Bighorn-Clarks Fork

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit Year 2000	Remaining Need Or Opportunity	Recommended Plan			Alternative Plan Responses				
					Provided SRD	Provided NED/EQ	Remaining Need	NED Provides	NED Remaining	EQ Provides	EQ Remaining	SRD All Programs
Fish and Wildlife												
a Stream Fishing	Miles Lost to Reservoirs	—	—	—	2	5	—	7	—	0	—	2
b Lake Fishing (flat water)	M Acres	See "Fishing" Days			4,510	1,490	—	3,680	—	320	—	4,510
c Habitat Protected	M Acres	NA	NA	NA								
d Habitat Developed	M Acres	NA	NA	NA								
e Fishing	Days	1,100,000	938,000	162,000	9,700	0	152,300	9 700	152,300	0	162,000	9 700
Outdoor Recreation												
a Land Area	Acres	523	0	523	260	316	53	200	323	444	79	260
b Water Area	Acres	3	0	3	5,351	1,805	7,153	6,266	6,263	622	619	5,470
c Wild, Scenic, Recr'n Rivers	Miles	428	0	428	20	310	98	123	305	428	0	20
d Recreation	Days	169,600	0	169,600	230,000	417,700	478,100	295,300	125,700	557,700	388 100	230,000
Water Quality Control and Instream Flow												
a Point Sources	W Q Standards				Assume compliance with "Water Quality Standards" by 1985							
b Nonpoint Sources	W Q Standards				Assume continued effort but longer term attainment of goals							
Instream Flows	State Program				Seek adequate legislation, reservations, and adequate administration							
Hydroelectric Power												
a Electric Generating Capacity	Megawatts	20	0	20	0	20	0	20	0	0	20	0
b Electric Generation	Gigawatts/hrs/yr	85	0	85	0	85	0	85	0	0	85	0

[a] Exclusive of 1250 hunting days provided in all plans
NA — Not available

Table 78. Comparison of Alternative Plans — Wind-Bighorn-Clarks Fork

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs. (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Thousand Dollars)							
1. NATIONAL ECONOMIC DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS[1]								
A Value of Increased Outputs/Goods/Services, and Value of Resources								
(1) Multipurpose[2]								
Total Cost	49,517[11]	3,731	53,248	37,738	15,510	1,353	51,895	43,335
Annual Cost	3,430	298	3,728	2,738	990	91	3,637	3,155
Annual Benefits	6,062	520	6,582	3,470	3,112	93	-6,489	2,914
(2) Agriculture (Irrigation)								
Total Cost	144,691[11]	35,890	180,581	62,067	118,514	0	180,581	210,368
Annual Cost	11,140	2,672	13,812	5,490	8,322	0	13,812	16,173
Annual Benefits	9,813	4,043	13,856	7,405	6,451	0	-13,856	12,734
(3) Energy Industry (Coal)[3]								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(4) Land Conservation Measures (Acceleration)								
Total Cost	0	36,474	36,474	36,474	0	36,474	0	0
Annual Cost	0	2,956	2,956	2,956	0	2,956	0	0
Annual Benefits	0	2,956	2,956	2,956	0	2,956	0	0
(5) Flood Control								
Total Cost	0	719	719	799	+80	0	719	0
Annual Cost	0	53	53	59	+6	0	-53	0
Annual Benefits	0	97	97	103	+6	0	97	0
(6) Streambank Erosion								
Total Cost	0	0	0	8	+8	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(7) Fish and Wildlife								
Total Cost	1,588	327	1,915	1,544	-371	1,147	-768	1,588
Annual Cost	185	21	206	126	80	133	73	185
Annual Benefits	116	21	236	137	-99	119	-117	116
(8) Outdoor Recreation								
Total Cost	6,136[11]	30,083	36,219	2,266	-33,953	48,793	+12,574	2,699
Annual Cost	1,162	2,602	3,764	422	-3,342	4,039	+275	1,021
Annual Benefits	190	2,031	2,221	689	1,532	2,486	+265	143
(9) Hydroelectric Power								
Total Cost	13,786	0	13,786	13,786	0	0	13,786	13,786
Annual Cost	969	0	969	969	0	0	-969	969
Annual Benefits	1,152	0	1,152	1,152	0	0	-1,152	1,152
(10) Municipal/Industrial Water Supply								
Total Cost	27,239[4]	0	27,239[4]	15,726	11,513	11,884[4]	15,355	27,239[4]
Annual Cost	756	0	756	756	0	782	+26	756
Annual Benefits	925	0	925	899	-26	0	-925	925
(11) Total Plan								
Total Cost	193,440	103,493	296,933	132,662	-164,271	98,298	-198,635	255,680
Annual Cost	14,212	8,304	22,516	10,778	-11,738	7,910	-14,606	19,024
Annual Benefits	12,196	9,148	36,630	13,341	-23,289	5,561	-31,069	15,070

[1] NED, EQ, and SRD "Annual Benefits" are "Direct" only. SRD includes other benefits in R D Account only
[2] Costs and benefits allocated to respective functions
[3] Energy Industry figures ( ) are not included in "Total Plan"
[4] Environmental Protection Dike, at Buffalo Bill Reservoir $11,884,000
[11] Clarks Fork offstream storage increased over NED and SRD plans (columns 5 & 9)

Table 78. Comparison of Alternative Plans — Wind-Bighorn-Clarks Fork

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
2. ENVIRONMENTAL QUALITY, BENEFICIAL AND ADVERSE EFFECTS								
A Open/Green Spaces, Wild/Scenic/Recreational Rivers Lakes, and Areas of Natural Beauty								
(1) Create Lakes (surface acres)	5,351	1,805	7,156	6,266	890	622	6,534	5,470
(2) Develop Greenbelts (X)	0	588	588	0	588	588	0	[illegible]
(3) Convert Agricultural/Other Lands to Wildlife Refuge (acres)	546	302	848	546	302	302	546	546
(4) Land Conversion to Recreation Areas (acres)	260	316	576	200	376	444	132	260
(5) Wild/Scenic/Recreation Rivers (miles)	128	300	428	128	300	428	0	128
(6) Wild/Scenic/Recreation Rivers (easement acres)	2,640	30 520	33 160	440	32 720	54 720	21 560	2 640
B Archaeological, Historical, Biological, and Geologic Resources, Selected Ecological Systems								
(1) Preserve Woodlands (acres) (+ or −)	0	63 796	63 796	0	63 796	63 796	[illegible]	[illegible]
(2) Preserve Unique Areas (acres) (National Wilderness Area)	0	97,000	97,000	0	97 000	[illegible]	[illegible]	[illegible]
(3) Preserve Add Wildlife Habitat (acres) See also (1)	302	0	302	302	[illegible]	[illegible]	[illegible]	[illegible]
(4) Improve Wildlife Habitat (acres)	0	170	170	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(5) Lose Stream Fishery (miles)	2	5	7	7	[illegible]	[illegible]	[illegible]	[illegible]
(6) Add Lake Reservoir Fishery (acres)	4 510	1,490	6 000	3 680	[illegible]	[illegible]	[illegible]	4 510
(7) Adopt Adequate Instream Flow Levels (X)	Areawide	Areawide	X	[illegible]	X	Areawide	[illegible]	Areawide
C Quality of Water, Air, and Land Resources								
(1) Accelerated Land Treatment (M acres)	0	1 994	1 994	1 994	[illegible]	1 994	[illegible]	[illegible]
(2) Reduction of Soil Loss Sediment Yield Nutrients (X)	0	X	X	X	[illegible]	[illegible]	[illegible]	[illegible]
(3) Improve Water Quality by Low Streamflow Augmentation (miles)	82	[illegible]	82	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(4) Area Affected by Strip Mining (average — M acres year)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(5) Area Affected by land reclamation (average acres year — 5 25 yr lag)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(6) Streamflow Degradation — Chemical Content of Return Flows (X)	X	X	X	X	[illegible]	[illegible]	X	X
(7) Air Pollutant Emissions — Particulates (tons year)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(8) Air Pollutant Emissions — Sulfur Oxides (tons year)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(9) Air Pollutant Emissions — Nitrogen Oxides (tons year)	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D Irreversible Commitment of Resources to Future Uses								
(1) Conversion of Agricultural Land, Terrestrial Habitat etc. to Reservoirs (acres)	5 351	1 805	7 156	6 266	890	[illegible]	[illegible]	[illegible]
(2) Conversion — Agricultural Land to Energy Plant Sites (acres)	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(3) Streamflow Depletion — Added Irrigation (ac ft)	179 900	60 400	240 300	[illegible]	108 100	[illegible]	[illegible]	[illegible]
(4) Streamflow Depletion — Added Energy Industry Coal (ac ft)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(5) Streamflow Depletion — Slurry Line Transport of Coal (ac-ft)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(6) Streamflow Depletion — Municipal/Industrial Water Supply (ac ft)	640	369	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 76. Comparison of Alternative Plans — North Dakota Tributaries

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
2. ENVIRONMENTAL QUALITY, BENEFICIAL AND ADVERSE EFFECTS								
A Open/Green Spaces, Wild/Scenic/Recreational Rivers, Lakes, and Areas of Natural Beauty								
(1) Create Lakes (surface acres)	0	0	0	10,900	+10,900	0	0	10,900
(2) Develop Greenbelts (X)	0	0	0	0	0	0	0	0
(3) Convert Agricultural/Other Lands to Wildlife Refuge (acres)	0	0	0	0	0	0	0	0
(4) Land Conversion to Recreation Areas (acres)	0	244	244	75	169	244	0	0
(5) Wild/Scenic/Recreation Rivers (miles)	249	75	324	75	249	335	+11	249
(6) Wild/Scenic/Recreation Rivers (easement acres)[9]	54,420	24,133	78,553	16 500	62,053	80,973	+2,420	54,420
B Archaeological, Historical, Biological, and Geologic Resources, Selected Ecological Systems								
(1) Preserve Woodlands (acres) (+ or −)	0	11,105	11,105	0	11,105	11,105	0	0
(2) Preserve Unique Areas (acres)	0	1,200	1,200	0	1,200	1,200	0	0
(3) Preserve/Add Wildlife Habitat (acres)	0	0	0	640	+640	0	0	0
(4) Improve Wildlife Habitat (acres)	0	95	95	95	0	0	95	0
(5) Lose Stream Fishery (miles)	0	0	0	40	+40	0	0	40
(6) Add Lake/Reservoir Fishery (acres)	0	0	0	7,300	+7,300	0	0	730
(7) Adopt Adequate Instream Flow Levels (X)	Areawide	Areawide	X	0	X	Areawide	0	Areawide
C Quality of Water, Air, and Land Resources								
(1) Accelerated Land Treatment (M acres)	0	1,806	1,806	1 806	0	1,806	0	0
(2) Reduction of Soil Loss/Sediment Yield/Nutrients (X)	0	X	X	X	0	X	0	0
(3) Improve Water Quality by Low Streamflow Augmentation (miles)	0	0	0	0	0	0	0	0
(4) Area Affected by Strip Mining (average — M acres/year)[8]	0	1,379	1,379	6,315	+4,936	728	651	0
(5) Streamflow Degradation — Chemical Content of Return Flows (X)	0	0	0	X	+X	0	0	X
(6) Air Pollutant Emissions — Particulates (tons/year)	0	12,872	12,872	20,403	+7,531	7,671	5,201	0
(7) Air Pollutant Emissions — Sulfur Oxides (tons/year)	0	153,324	153,324	244,835	+91,511	92,052	61,272	0
(8) Air Pollutant Emissions — Nitrogen Oxides (tons/year)	0	279,065	279,065	204,029	75,036	76,710	202,355	0
D Irreversible Commitment of Resources to Future Uses								
(1) Conversion of Agricultural Land, Terrestrial Habitat, etc., to Reservoirs (acres)	0	0	0	10,900	+10,900	0	0	10,900
(2) Conversion — Agricultural Land to Energy Plant Sites (acres)	0	6,793	6,793	13,819	+7,026	3,800	2,993	0
(3) Streamflow Depletion — Added Irrigation (ac-ft)	0	0	0	20,000	+20,000	0	0	95,000
(4) Streamflow Depletion — Added Energy Industry — Coal (ac-ft)	0	74,744	74,744	129,880	+55,136	41,568	33,176	0
(5) Streamflow Depletion — Slurry Line Transport of Coal (ac-ft)	0	0	0	80,748	+80,748	0	0	0
(6) Streamflow Depletion — Municipal/Industrial Water Supply (ac-ft)	0	0	0	45,000	+45,000	0	0	0

[8] Five to 25-year lag to attain full productivity through land reclamation
[9] Includes 7,633 acres for preservation of unique area

Table 78. Comparison of Alternative Plans — Wind-Bighorn-Clarks Fork

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
(6) Provide Energy Industry Water Supply								
(a) Mines and Land Reclamation (ac-ft/yr)	0	0	0	0	0	0	0	0
(b) Coal Gasification (ac-ft/yr)	0	0	0	0	0	0	0	0
(c) Electric Generation (ac-ft/yr)	0	0	0	0	0	0	0	0
(d) Slurry Pipeline (ac-ft/yr)	0	0	0	0	0	0	0	0
(7) Production By Energy Industry								
(a) Electrical Generation Capacity (megawatts)	0	0	0	0	0	0	0	0
(b) Electrical Generation (gigawatts/hrs/yr)	0	0	0	0	0	0	0	0
(c) Syngas Production (MC f/d)	0	0	0	0	0	0	0	0
(8) Land Conservation (Acceleration) (M acres)	0	1,994	1,994	1,994	0	1,994	0	0
(9) Land Use Shift Wildlife/Agriculture to Recreation (acres)	260	316	576	200	376	444	132	260
(10) Hydroelectric Power Production								
(a) Electrical Generation Capacity (megawatts)	20	0	20	20	0	0	20	20
(b) Electrical Generation (gigawatts/hrs/yr)	85	0	85	85	0	0	85	85
E Total Plan (1,000 dollars)								
(1) Federal Cost	0	58,174	58,174	59,795	+1,621	68,800	+10,626	0
(2) Nonfederal Cost	193,440	45,319	238,759	72,867	165,892	29,498	209,261	255,680
(3) Total Cost	193,440	103,493	296,933	132,662	164,271	98,298	198,635	255,680
(4) Associated Coal Industry Investment	0	0	0	0	0	0	0	0
4 SOCIAL WELL-BEING, BENEFICIAL AND ADVERSE EFFECTS								
A Effects on Real Incomes								
(1) Increase Annual Income — Plan Components (M $)	9,935	13,985	23,920	15,215	8,705	9,665	14,255	17,915
(2) Increase Annual Income — Coal Industry (M $)	0	0	0	0	0	0	0	0
(3) Increase, Stabilize, Redistribute Income — Plan Components (M $)	19,870	27,970	47,840	30,430	17,410	19,330	28,510	35,830
(4) Increase, Stabilize, Redistribute Income — Coal Industry (M $)	0	0	0	0	0	0	[illegible]	0
B Security of Life, Health, and Safety								
(1) Provide Flood Protection, Urban Area (acres/M people)	0	300/1	300/1	300/1	0	0	300/1	0
(2) Provide Flood Regulation by Reservoirs (M ac ft)[11]	0	14,680	14,680	15,450	-770	0	14,680	0
(3) Increased Air Pollution Within State Standards (X)				See Environmental Quality 2C				
(4) Reduce (-) Increase Water Pollution (X)				See Environmental Quality 2C				
(5) Added, Dependable Food Supplies (X)	X	X	X	X	0	0	X	X
(6) Added Energy Supplies (X)	0	0	0	0	0	0	[illegible]	0
(7) Population Impact — Plan Components (No)	3,270	4,620	7,890	5,005	2,885	3,155	4,[illegible]	5,[illegible]
(8) Population Impact Coal Industry (No)	0	0	0	0	0	0	[illegible]	0
C Educational, Cultural, and Recreational Opportunity								
(1) Added Hunting (hunting days)	1,250	0	1,250	1,250	0	1,250	[illegible]	[illegible]
(2) Added Fishing (fishing days)	9,700	0	9,700	9,700	0	[illegible]	9,700	9,[illegible]
(3) Added Recreation (recreation days)	230,000	417,700	647,700	295,300	352,400	5[illegible]	90,[illegible]	[illegible]
(4) Added Social Health Educational Pressures — Energy Related (X)	0	0	0	0	0	[illegible]	[illegible]	[illegible]

[11] Rural area protected 11,000 acres

Table 79. Alternate Plan Capability — Northeast Wyoming

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit Year 2000	Remaining Need Or Opportunity	Recommended Plan			Alternative Plan Responses				
					Provided SRD	Provided NED EO	Remaining Need	NED Provides	NED Remaining	EO Provides	EO Remaining	SRD All Programs
Agriculture (Irrigation)												
a Low (3E)	Ac	98,000	109,000	-11,000		(18,400)[7]	16,030	(18,400)[7]	-20,780	0	11,000	(15,400)[7]
b High (3E')	Ac	107,000	109,000	2,000	4,700[8]	330[8]	7,030	9,780[8]	11,780	0	2,000	4,700
c Livestock (Beef, Hogs, Sheep)	M feed units E'	2,398	3,079	681	132	9	822	278	959	0	681	132
d Livestock Produced (Beef, Hogs, Sheep)	MM lbs E'	194	197	3	7	9	11	15	-18	0	3	8
Municipal, Rural Domestic, and Livestock Water	Ac-ft Consumed	39,000	24 000	15,000	15,000[1]	0	0	15,000[1]	0	0	15 000	15,000[1]
Nonenergy Industrial Water	AF Consumed	400	400	0	0	0	0	0	0	0	0	0
Energy Industry (Coal)												
a Coal Production — Low	M tons	74,500										
Coal Production — Most Probable	M tons	131,920										
Coal Production — High	M tons	203,470	203,470	(0)	(0)	(203 470)	(0)	(203,470)	(0)	(132,000)	(71 470)	0
b Thermal Elec Capacity — Low	Megawatts	390										
Thermal Elec Capacity — M Probable	Megawatts	390										
Thermal Elec Capacity — High	Megawatts	390	2,390	-(2,000)	(0)	(2,390)	(2,000)	(2,390)	-(2,000)	(2,390)	-(2,000)	0
c Thermal Elec Production — Low	Gigawatts/hrs/yr	2,392										
Thermal Elec Production — M Probable	Gigawatts/hrs/yr	2,393										
Thermal Elec Production — High	Gigawatts/hrs/yr	2,393	12,913	-(10,520)	(0)	(12,913)	(10,520)	(12,913)	-(10,520)	(18,712)	(16,319)	0
d Syngas Production — Low	MC fd	0										
Syngas Production — M Prob	MC fd	790										
Syngas Production — High	MC fd	1,330	1,330	(0)	(0)	(0)	(1,330)	(0)	(1,330)	(0)	(1,330)	0
e Water Consumed — Low	Ac-ft	9,586										
Water Consumed — M Prob	Ac-ft	44,115										
Water Consumed — High	Ac-ft	92,320	117,622	(25,302)	0	(102,520)	(10,200)	(102,520)	(10 200)	(50,215)	(42 105)	0
f Export-Rail/Slurry — High	M tons	157,500	73,100	(84,400)	0	(196,640)	(39 140)	(196,640)	(39,140)	(125,170)	(32,330)	0
Land Conservation Measures												
a Area Requiring Treatment	M Ac	14,213	2,725	11,488	0	5,799	5,689	5,799	5,689	11,488	0	0
b Capitalized Cost	M Dollars	106,863	34,875	71,988	0	36,998	34,990	36 998	34,990	71,988	0	0
Flood Control												
a Area Affected	M Ac	107	0	107	10	5	92	15	92	0	107	10
b Damage	M Dollars	1,631	0	1,631	163	71	1,397	225	1,406	0	1,631	163
Streambank Erosion												
a Affected	Bank miles	3,715	0	3,715	0	3	3,712	3	3,712	0	3,715	0
b Damage	M Dollars	520	0	520	0	2	518	2	518	0	520	0

[1] Partially supplied by proposals herein from ground water source
[7] Supplemental water supply
[8] Full water supply

Table 79. Alternate Plan Capability — Northeast Wyoming

Function	Unit	Need Or Opportunity Year 2000	Without Plan Condit Year 2000	Remaining Need Or Opportunity	Recommended Plan: Provided SRD	Recommended Plan: Provided NED/EQ	Recommended Plan: Remaining Need	Alternative Plan Responses: NED Provides	Alternative Plan Responses: NED Remaining	Alternative Plan Responses: EQ Provides	Alternative Plan Responses: EQ Remaining	Alternative Plan Responses: SRD All Programs
Fish and Wildlife												
a Stream Fishing	Miles Lost to Reservoirs	—	—	—	5	5	—	10	—	0	—	6
b Lake Fishing (flat water)	M Acres		See "Fishing" Days		3,600	542	—	4,440	—	0	—	16,835
c Habitat Protected	M Acres	NA	NA	NA	0	0	NA	0	NA	0	NA	0
d Habitat Developed	M Acres	NA	NA	NA								
e Fishing	Days	650,000	465,000	185,000	22,000	6,000	157,000	28,000	158,000	0	185,000	22,000
Outdoor Recreation												
a Land Area	Acres	5	0	5	68	64	125	68	63	68	63	68
b Water Area	Acres	5	0	5	6,250	875	7,120	7,365	7 360	0	5	6 725
c Wild, Scenic Recr'n Rivers	Miles	88	0	88	35	53	0	26	62	88	0	35
d Recreation	Days	97 800	0	97,800	103,400	80,900	86,500	98 800	1 000	118,500	20 700	103 400
Water Quality Control and Instream Flow												
a Point Sources	W Q Standards				Assume compliance with "Water Quality Standards" by 1985							
b Nonpoint Sources	W Q Standards				Assume continued efforts but longer term attainment of goals							
Instream Flows	State Program				Seek adequate legislation, reservations and adequate administration							
Hydroelectric Power												
a Electric Generating Capacity	Megawatts	0	0	0	0	0	0	0	0	0	0	0
b Electric Generation	Gigawatts/hrs/yr	0	0	0	0	0	0	0	0	0	0	0
Municipal/Industrial Water Supply	Acre Feet	NA	NA	15,000	15,000	0	0	15,000	0	0	15,000	15,000

NA — Not available

Table 80. Comparison of Alternative Plans — Northeast Wyoming

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Thousand Dollars)							
1. NATIONAL ECONOMIC DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS[1]								
A Value of Increased Outputs/Goods/Services, and Value of Resources								
(1) Multipurpose[2]								
Total Cost	189,512	2,577	192,089	216,586	+24 497	0	-192,089	214 009
Annual Cost	18,741	195	18,936	20 174	+1,238	0	18,936	19,979
Annual Benefits	22,139	312	22,451	26,675	+4,224	0	−22,451	33,958
(2) Agriculture (Irrigation)								
Total Cost	20,233	6,929	27,162	35,372	+8,210	0	−27,162	25,410
Annual Cost	1,276	505	1,781	2,281	+500	0	1,781	1,619
Annual Benefits	1,331	637	1,968	2,480	+512	0	−1,968	1,688
(3) Energy Industry (Coal)[3]								
Total Cost	0	(1,692,000)	(1,692,000)	(1,692,000)	0	(1,321,000)	−(371,000)	
Annual Cost	0	(619,330)	(619,330)	(619,330)	0	(398,800)	−(220,530)	
Annual Benefits	0	(728,500)	(728 500)	(728,500)	0	(339,700)	−(388,800)	0
(4) Land Conservation Measures (Acceleration)								
Total Cost	0	36,998	36,998	36,998	0	71,988	+34,990	0
Annual Cost	0	2,998	2,998	2,998	0	4,600	+1,602	0
Annual Benefits	0	2,998	2,998	2,998	0	4,600	+1,602	0
(5) Flood Control								
Total Cost	265	1,149	1,414	1,414	0	0	−1,414	265
Annual Cost	139	71	210	210	0	0	−210	139
Annual Benefits	154	71	225	225	0	0	225	154
(6) Streambank Erosion								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(7) Fish and Wildlife								
Total Cost	132	0	132	132	0	0	132	132
Annual Cost	64	0	64	64	0	0	−64	64
Annual Benefits	71	0	71	71	0	0	71	71
(8) Outdoor Recreation								
Total Cost	3,548	396	3,944	2,115	1,829	2,045	1,899	3,548
Annual Cost	426	125	551	312	−239	299	−252	426
Annual Benefits	460	223	683	362	−321	389	294	460
(9) Hydroelectric Power								
Total Cost	0	0	0	0	0	0	0	0
Annual Cost	0	0	0	0	0	0	0	0
Annual Benefits	0	0	0	0	0	0	0	0
(10) Municipal/Industrial Water Supply								
Total Cost	167,163	0	167,163	186,483	+19,320	0	167,163	186,483
Annual Cost	17,033	0	17,033	17,928	+895	0	−17,033	17,928
Annual Benefits	20,312	0	20,312	24,179	+3,867	0	−20,312	24,179
(11) Total Plan								
Total Cost	191,341	45,472	236,813	262,514	+25,701	74,033	162,780	215,838
Annual Cost	18,938	3,699	22,637	23,793	+1,156	4,899	−17,738	20,176
Annual Benefits	22,328	3,929	26,257	30,315	+4,058	4,989	−21,268	26,552

[1] NED, EQ, and SRD "Annual Benefits" are "Direct" only. SRD includes other benefits in R D Account only

[2] Costs and benefits allocated to respective functions

[3] Energy Industry figures ( ) are not included in "Total Plan"

Table 80. Comparison of Alternative Plans — Northeast Wyoming

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs. (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(Units As Shown)							
2. ENVIRONMENTAL QUALITY, BENEFICIAL AND ADVERSE EFFECTS								
A Open/Green Spaces, Wild/Scenic/Recreational Rivers, Lakes, and Areas of Natural Beauty								
(1) Create Lakes (surface acres)	6,250	875	7,125	7,365	+240	0	7,125	6,725
(2) Develop Greenbelts (X)	0	0	0	0	0	0	0	0
(3) Convert Agricultural/Other Lands to Wildlife Refuge (acres)	0	0	0	0	0	0	0	0
(4) Land Conversion to Recreation Areas (acres)	132	0	132	0	−132	132	0	132
(5) Wild/Scenic/Recreation Rivers (miles)	35	63	98	26	−72	98	0	35
(6) Wild/Scenic/Recreation Rivers (easement acres)	2,121	0	2,121	0	−2,121	2,121	0	2 121
B Archaeological, Historical, Biological, and Geologic Resources, Selected Ecological Systems								
(1) Preserve Woodlands (acres) (+ or −)	0	299	299	299	0	0	299	0
(2) Preserve Unique Areas (acres)	0	0	0	0	0	0	0	0
(3) Preserve/Add Wildlife Habitat (acres)	0	0	0	0	0	0	0	0
(4) Improve Wildlife Habitat (acres)	0	0	0	0	0	0	0	0
(5) Lose Stream Fishery (miles)	5	5	10	10	0	0	10	6
(6) Add Lake/Reservoir Fishery (acres)	3,600	542	4,142	4,440	+298	0	4,142	16,835
(7) Adopt Adequate Instream Flow Levels (X)	Areawide	Areawide	X	0	X	Areawide	0	Areawide
C Quality of Water, Air, and Land Resources								
(1) Accelerated Land Treatment (M acres)	0	5,799	5,799	5,799	0	11,488	+5 689	0
(2) Reduction of Soil Loss/Sediment Yield/Nutrients (X)	0	X	X	X	0	X	0	0
(3) Improve Water Quality by Low Streamflow Augmentation (miles)	55	0	55	55	0	0	55	55
(4) Area Affected by Strip Mining (average — M acres/year)[a]	0	1,516	1,516	1,516	0	2 960	+1 444	0
(5) Streamflow Degradation — Chemical Content of Return Flows (X)	X	X	X	X	0	0	X	X
(6) Air Pollutant Emissions — Particulates (tons/year)	0	6,454	6,454	6,454	0	6 454	0	0
(7) Air Pollutant Emissions — Sulfur Oxides (tons/year)	0	77,467	77,467	77,467	0	77 467	0	0
(8) Air Pollutant Emissions — Nitrogen Oxides (tons/year)	0	64,554	64,554	64 554	0	64,554	0	0
D Irreversible Commitment of Resources to Future Uses								
(1) Conversion of Agricultural Land, Terrestrial Habitat, etc., to Reservoirs (acres)	6,250	875	7,125	7,365	+240	0	7 125	6 [illegible]
(2) Conversion — Agricultural Land to Energy Plant Sites (acres)	0	8 614	8,614	8 614	0	6 424	2 190	0
(3) Streamflow Depletion — Added Irrigation (ac-ft)	2,200	24 000	26,200	32,600	+6,400	0	26 200	12 200
(4) Streamflow Depletion — Added Energy Industry — Coal (ac-ft)	36,275	0	36,275	36,275	0	34 666	1 609	36 275
(5) Streamflow Depletion — Slurry Line Transport of Coal (ac-ft)	31,256	0	31,256	31,256	0	0	31 256	31 256
(6) Streamflow Depletion — Municipal/Industrial Water Supply (ac-ft)	5,000	0	5,000	5,000	0	4 000	1 000	5 000

[a] Five to 25-year lag to attain full productivity through land reclamation

Table 80. Comparison of Alternative Plans — Northeast Wyoming

Account and Component	Recommended Plan (RP) Provided			National Economic Development Plan (NED)		Environmental Quality Plan (EQ)		State-Regional Development (SRD)
	SRD	NED/EQ	Total	Provided	(5) vs (4)	Provided	(7) vs (4)	All Programs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. REGIONAL DEVELOPMENT, BENEFICIAL AND ADVERSE EFFECTS				(Thousand Dollars)				
A Value to Users of Increased Goods/Services — Study Area Residents								
(1) Agriculture (Irrigation)	1,570	637	2,207	2,480	+273	0	2,207	2,210
(2) Energy Industry — Coal	0	(728,500)	(728,500)	(728,500)	0	(339,700)	(388,800)	0
(3) Land Conservation Measures — Accelerated	0	2,998	2,998	2,998	0	4,600	+1,602	0
(4) Flood Control	163	71	234	225	9	0	234	163
(5) Streambank Erosion	0	0	0	0	0	0	0	0
(6) Fish and Wildlife	75	0	75	71	4	0	75	75
(7) Outdoor Recreation	833	223	1,056	362	694	389	667	833
(8) Hydroelectric Power	0	0	0	0	0	0	0	0
(9) Municipal/Industrial Water Supply	27,605	0	27,605	24,179	−3,426	0	27,605	34,560
(10) Total Plan	30,246	3,929	34,175	30,315	3,860	4,989	−29,186	37,841
B Additional Income Accruing to Residents								
(1) Agriculture (Irrigation)	600	495	1,095	1,425	+330	0	1,095	615
(2) Energy Industry — Coal	0	(61,240)	(61,240)	(61,240)	0	(41,370)	−(19,870)	0
(3) Land Conservaton Measures — Accelerated	0	8,850	8,850	8,850	0	17,700	+8,850	0
(4) Flood Control	15	15	30	30	0	0	30	15
(5) Fish and Wildlife	15	15	30	15	15	0	30	15
(6) Outdoor Recreation	200	85	285	260	25	140	145	200
(7) Hydroelectric Power	0	0	0	0	0	0	0	0
(8) Municipal/Industrial Water Supply	330	0	330	390	+60	0	330	390
(9) Total Plan	1,160	9,460	10,620	10,970	+350	17,840	+7,220	1,235
C Net Beneficial Employment — Number of Jobs — Permanent Direct				(Units As Shown)				
(1) Agriculture (Irrigation)	40	33	73	95	+22	0	73	41
(2) Energy Industry — Coal	0	(4,083)	(4,083)	(4,083)	0	(2,758)	(1,325)	0
(3) Land Conservation	0	590	590	590	0	1,180	+590	0
(4) Flood Control	1	1	2	2	0	0	2	1
(5) Fish and Wildlife	1	1	2	1	1	0	2	1
(6) Outdoor Recreation	10	5	15	13	2	7	8	10
(7) Hydroelectric Power	0	0	0	0	0	0	0	0
(8) Municipal/Industrial Water Supply	22	0	22	26	+4	0	22	26
(9) Total	74	630	704	727	+23	1,187	+483	79
D Regional Economic Base and Stability — To Year 2000								
(1) Convert Dry Land to Irrigated Agriculture (acres)	4,700	330	5,030	9,780	+4,750	0	5,030	4,700
(2) Improve Irrigation Systems (acres)	0	0	0	0	0	0	0	0
(3) Provide Supplemental Irrigation Water Supply (acres)	6,200	12,200	18,400	18,400	0	0	18,400	15,400
(4) Provide Municipal/Industrial Water (ac-ft)	15,000	0	15,000	15,000	0	0	15,000	15,000
(5) Provide Coal for Regional/National Needs								
(a) Transport By Rail (M tons/year)	0	137,640	137,640	137,640	0	110,170	−27,470	0
(b) Transport by Slurry Pipeline (M tons/year)	0	59,000	59,000	59,000	0	15,000	44,000	0
(c) Convert to Electricity in Study Area (M tons/year)	0	6,830	6,830	6,830	0	6,830	0	0
(d) Convert to Gas in Study Area (M tons/year)	0	0	0	0	0	0	0	0

Table 80. Comparison of Alternative Plans — Northeast Wyoming

Account and Component (1)	Recommended Plan (RP) Provided: SRD (2)	Recommended Plan (RP) Provided: NED/EQ (3)	Total (4)	National Economic Development Plan (NED): Provided (5)	(5) vs (4) (6)	Environmental Quality Plan (EQ): Provided (7)	(7) vs (4) (8)	State-Regional Development (SRD): All Programs (9)
	(Units As Shown)							
(6) Provide Energy Industry Water Supply								
(a) Mines and Land Reclamation (ac ft/yr)	0	9 980	9,980	9,980	0	3,932	6,948	0
(b) Coal Gasification (ac-ft/yr)	0	0	0	0	0	0	0	0
(c) Electric Generation (ac-ft/yr)	0	31 284	31 284	31,284	0	31 283	0	0
(d) Slurry Pipeline (ac ft/yr)	0	61,256	61 256	61 256	0	15 000	46 [illegible]56	0
(7) Production By Energy Industry								
(a) Electrical Generation Capacity (megawatts)	0	(2,390)	(2 390)	(2,390)	0	(2 390)	0	0
(b) Electrical Generation (gigawatts hrs/yr)	0	(12,913)	(12 913)	(12,913)	0	(18 [illegible]12)	([illegible]99)	0
(c) Syngas Production (MC f/d)	0	0	0	0	0	0	0	0
(8) Land Conservation (Acceleration) (M acres)	0	5 799	5 799	5 799	0	11 488	+5 689	0
(9) Land Use Shift Wildlife Agriculture to Recreation (acres)	68	64	132	64	68	132	0	68
(10) Hydroelectric Power Production								
(a) Electrical Generation Capacity (megawatts)	0	0	0	0	0	0	0	0
(b) Electrical Generation (gigawatts hrs/yr)	0	0	0	0	0	0	0	0
E Total Plan (1 000 dollars)								
(1) Federal Cost	0	8 660	8 660	24 997	+16 [illegible]	9 [illegible]	[illegible]18	
(2) Nonfederal Cost	191,341	36 812	228 153	237 517	+9 364	64 8[illegible]	16 [illegible]	[illegible]
(3) Total Cost	191,341	45,472	236 813	262,514	+25 701	74 033	16[illegible]780	[illegible]
(4) Associated Coal Industry Investment	0	(1,692 000)	(1 692 000)	(1 692 000)	0	[illegible]	[illegible]	0
4. SOCIAL WELL-BEING BENEFICIAL AND ADVERSE EFFECTS								
A Effects on Real Incomes								
(1) Increase Annual Income — Plan Components (M $)	1 160	9 460	10 620	10 970	+350	[illegible] 840	[illegible]	1 [illegible]
(2) Increase Annual Income — Coal Industry (M $)	0	(61 240)	(61 240)	(61 240)	0	(41 [illegible])	[illegible]19 [illegible]	0
(3) Increase Stabilize Redistribute Income — Plan Components (M $)	2,320	18 920	21 240	21 940	+700	35,680	+14 440	2 47[illegible]
(4) Increase Stabilize Redistribute Income — Coal Industry (M $)	0	(122 480)	(122 480)	(122 480)	0	(82 740)	[illegible]	0
B Security of Life Health and Safety								
(1) Provide Flood Protection Urban Area (acres M people)	0	205/10	205 10	205 10	0	0	[illegible]	0
(2) Provide Flood Regulation by Reservoirs (M ac ft)[1]	2 000	2 100	4 100	4 100	0	0	[illegible]	[illegible]
(3) Increased Air Pollution Within State Standards (X)			See	Environmental Quality				
(4) Reduce ( ) Increase Water Pollution (X)			See	Environmental Quality				
(5) Added Dependable Food Supplies (X)	X	X	X	X	0	0	X	X
(6) Added Energy Supplies (X)	X	X	X	X	0	0	X	X
(7) Population Impact — Plan Components (No)	370	3 150	3 520	3,635	+115	5 935	+2 415	394
(8) Population Impact Coal Industry (No)	0	(20 415)	(20 415)	(20 415)	0	[illegible]	[illegible]	0
C Educational Cultural and Recreational Opportunity								
(1) Added Hunting (hunting days)	0	0	0	0	0	0	0	0
(2) Added Fishing (fishing days)	22 000	6 000	28 000	28 000	0	0	28 [illegible]	[illegible]
(3) Added Recreation (recreation days)	103 400	80 900	184 300	98 800	85 [illegible]	118 5[illegible]	65 8[illegible]	[illegible] 400
(4) Added Social Health Educational Pressures — Energy Related (X)	0	X	X	X	0	0	X	0

[1]Rural areas protected 1,000 acres

Table 81
Land Use Conversions Recommended Plan

Planning Area	Irrigated Land	Nonirrigated Land	Dryland Pasture	Dryland Range	Forest Woodland, Unique Area Preservation	Recreational Development	Wildlife Refuges Habitat	Water Area	Industrial Sites (Coal)
	Acres								
Upper Yellowstone	+14,240	−14,240	—	−615,624	+613,500	+314	+1,810		0
Clarks Fork-Bighorn	+49,670	−49,670	—	−300,844	+300,000	+140	0	+704	0
Tongue-Powder	+13,000	−13,000	—	−6,276	Greenbelts	+136	0	+2,700	+3,440
Lower Yellowstone	+39,050	−39,050	—	−7,830	Greenbelts	+200	0	0	+7,630
North Dakota Tributaries	0	−6,803	−10,215	−3,419	+12,305	+244	+95	0	+6,793
Wind-Bighorn Clarks Fork	+122,237	−2,150	−1,173	−288,762	+160,796	+576	+1,320	+7,156	0
Northeast Wyoming	+5,030	−850	−398	−19,952	+299	+132	0	+7,125	+8,614
Study Area	+243,227	−125,763	−11,786	−1,242,707	+1,087,900	+1,742	+1,415	+19,495	+26,477

In the aggregate, conversions of agricultural lands to industrial plant sites may affect about 26,500 acres, with the average area affected by coal strip mining being about 6,800 acres per year. Sizeable increases in air pollutant emission would occur as estimated in table 66 with State standards. Coal production under the recommended plan (table 65) would fall beneath the national need of the study area by 35 percent, with thermal electric production meeting the need (opportunity), and synthetic gas production satisfying only 4 percent of the forecasted need.

Virtually all of the programs and projects involve some measure of conservation. About 13 million acres would be subjected to accelerated land treatment, improving water quality, and providing some measure of flood control and sediment reduction. Over 1,840 acres of urban area would receive structural flood protection, affecting some 20,000 people. Others would gain some protection as a result of projects built for other purposes and through flood plain management.

These and other changes reflected in table 66 are associated with the recommended plan. They are in addition to or in lieu of other changes in land use that would occur from "without" plan activities not reflected in the plan components.

Water Use Impacts

Full implementation of the recommended plan could increase streamflow depletions from the Yellowstone River at Sidney, Mont., by 909,000 acre-feet per annum by the year 2000. This increase does not include noninteracting ground water usage, but it does include an estimated 461,000 acre-feet above Sidney, Mont., attributable to the "without" plan conditions and 448,000 acre-feet attributable to the recommended plan. Depleted flows for 1975 together with anticipated depletions to the year 2000 at 16 locations are shown in table 82; also shown are estimated average effects on water quality based on the general indicator "total dissolved solids."

Table 82
Depletions to Streamflow and Water Quality Impacts
Present Conditions and Recommended Plan

	Average Annual Flow Thousand Acre-Feet			Average Water Quality - TDS Total Dissolved Solids		
Gaging Station	1975	2000[a]	% Reduction[a]	1975	2000	% Increase
Wind River below		1044	0.3			
Boysen Res., Wyo.	1047	983	6.1	*	*	
Greybull River at		122				
Byron, Wyo.	122	122	0	*	*	
Shoshone River at		595	1.8			
Lovell, Wyo.	606	521	14.0	*	*	
Bighorn River at		2416	1.2			
St. Xavier, Mont.	2444	2176	8.4	*	*	
Tongue River near		252	20.3		540	7.1
Miles City, Mont.	316	249	21.2	504	539	6.9
Powder River at		133	27.3			
Arrada, Wyo.	183	166	9.3	*	*	
Powder River at		361	14.7			
Locate, Wyo.	423	335	20.8	*	*	
Little Missouri R. at		405	3.8			
Watford City, N. Dak.	421	405	3.8	*	*	
Knife River at		113	5.0			
Hazen, N. Dak.	119	113	5.0	*	*	
Heart River at		140	13.0			
Mandan, N. Dak.	161	140	13.0	*	*	
Cannonball River at		143	9.5			
Breien, N. Dak.	158	143	9.5	*	*	
Belle Fourche R. at		63	0			
N.-S. Dak. State Line	63	63	0	*	*	
Cheyenne River at		44	0			
Edgemont, S. Dak.	44	44	0	*	*	
Yellowstone River at		5218	10.4		201	0.5
Billings, Mont.	5273	5189	15.9	200	201	0.5
Yellowstone River at		8033	3.3		417	1.5
Miles City, Mont.	8308	7639	8.1	411	426	3.6
Yellowstone River at		8280	5.2		478	2.1
Sidney, Mont.	8741	7832	10.4	468	488	4.3

a. Without/and Recommended Plan Conditions

* Information was not developed to give an average annual value at these gaging stations

Average annual streamflow depletion of 554,000 acre-feet would result by the year 2000 from added irrigation development. Energy requirements for water could amount to around 262,000 acre-feet, about 60 percent for electric and synthetic gas production, and about 78,000 acre-feet for slurry line export of coal. Hydroelectric plants would provide 309 megawatts of generating capacity, with the bulk of the energy being of the peaking category. Municipal, rural domestic, and livestock uses may increase by nearly 305,000 acre-feet.

In the year 2000, anticipated depletions affecting the Yellowstone System would be 12,400 acre-feet for the Clarks Fork (2.9 percent of the water available to Wyoming); 238,000 for the Wind-Bighorn (13.2 percent of available); and 100,000 acre-feet for the Tongue and Powder Rivers (44 percent of available). The individual planning area reports and the river operations ad hoc group report contain extensive information concerning the hydrologic criteria and studies.

Much of the increased water use would occur utilizing offseason flows taken into storage. This storage, combined with irrigation return flows of considerable magnitude, will dampen the extremes of both high and low flows.

Total water requirements (262,000 acre-feet) for coal energy development are significantly less than some of the earlier projections. There is the outlook for adequate water supplies for the energy industry. This, of course, presupposes that gasification development will be quite limited. However, if conversion beyond the levels shown in the recommended plan does occur, the requirement cited above is understated (see table 65).

In terms of water quality, table 82 shows increases in TDS that range from minor to about 7 percent as annual averages, but where low flow discharges and resultant higher chemical concentrations may become of concern. At Sidney, Mont., the "without" plan increase would be about 2 percent and the recommended plan would increase this to about 4.3 percent.

Environmental Impacts

Under the EQ account of tables 66, 68, 70, 72, 74, 76, 78, and 80, the effects of the recommended and alternative plans are summarized.

Descriptive and numerical evaluations are made for a wide range of environmental indices.

The outdoor recreation components are designed to meet foreseeable needs for all activities, but they show some shortfalls overall for recreation days. Recommended components will protect by designation and easement major areas along 1,630 miles of river together with the special areas needed to maintain and enhance the overall recreation experience. Reference is made earlier in this chapter to the magnitude and nature of land use changes in this field. Accelerated land conservation on nearly 13 million acres of public and private land will provide benefits to lake and stream waters subject to man-induced pollution. Areas of woodland and unique areas totaling well over 1 million acres are recommended for public designation and preservation. Nearly 20,000 surface acres of water would be created for multiple uses including recreation, fishing, and aquatic habitat. Recommended plan elements together with existing developments and those to be attained under "without" programs should maintain or enhance the study area reputation as one of the Nation's prime outdoor recreation regions.

The plan includes general provisions but few specifics for instream flow improvements for fish and wildlife, general water quality, and other uses. Tentative determinations have been made in the

planning area reports of desirable monthly instream flows at many locations, but much added study is needed to develop better instream flow determination techniques. Also needed is greater public recognition of the fact that mounting withdrawals will ultimately reduce the availability and quality of fish and wildlife habitat and organisms that can occupy that habitat.

Several components for streamflow augmentation would be provided as a result of water storage and movement, but the quantities available are not necessarily optimum and areas affected are minimal. Aside from the potentials shown, no opportunities were found where water was available and where needed quantities could be developed and regulated at costs commensurate with the benefits that could be identified. Certainly changes in both land and water uses resulting from the overall plan would have effects, some favorable and some adverse, to game and fish values.

State game and fish management people have developed effective resource and management plans to keep supplies and demands in balance within the limits of water qualities, habitat areas, and other resources available and planned. Some 32 miles of stream fishery could be lost due to the imposition of reservoirs, but the resulting flat water areas aggregating about 20,000 acres could fulfill a recognized need for this type of recreation resource. Added stream access could result in added capability to fulfill fishing and general recreation needs by taking advantage of values already present but not fully utilized.

Both State and Federal laws and regulations provide means for controlling developments so as to protect water, land, and air resources. By the year 2000, about 6,800 acres would be disturbed each year as a result of the level of coal development contained in the recommended plan that compares to over 11,700 acres per year without the plan. With enforced land reclamation, the cover should be restored and made fully productive, but lags of 5 to 25 years are possible in attaining full productivity. Consequently, it is possible that at any given time several times the above number of acres will be in some stage of disruption. Without the plan, the number of acres could be almost twice as high. Air pollution emissions associated with recommended thermal electric and gasification installations would be held within State standards. By and large, streamflow depletions are considered irreversible commitments of resources to future uses, and many land dedications are difficult to change. Table 82 shows, however, that in the aggregate the 743,000 acre-feet of anticipated depletion for all proposed developments in the plan above the North Dakota line would represent 8.5 percent of the present condition's average annual flow of the Yellowstone River at Sidney. State determination of policy regarding the reservation of instream flows will permit each application for additional uses to be evaluated and approved, adjusted, or denied in the broad public interest.

Socioeconomic Impacts

The recommended plan will have major impacts on the region's social and economic structure. The primary effect will be the reduction of energy-related employment and the associated population compared to the without plan situation. The following figures show the employment impact and total population of the recommended plan compared to the without plan.

	1985	2000
Total Employment Impact		
Without Plan	28,945	68,730
Recommended Plan	16,820	26,620
Reduction due to plan	12,125	42,140
Total Population		
Without Plan	617,850	735,210
Recommended Plan	588,630	657,060
Reduction due to plan	29,220	78,150

The reduced level of employment is primarily due to reductions in the level of energy development. Since the unemployment levels in the region were generally low already and are expected to remain low, the reduction in employment will primarily mean a reduction in the number of people moving into the area.

The nonenergy components of the plan are expected to contribute to stabilization of the region's population. Some additional jobs will be provided, but growth of the existing population should provide adequate employees for the nonenergy-type jobs. Even though the recommended plan reduces overall population impacts due to energy, certain areas will still face needs for public facilities that will create problems. Small communities will find water and sewer facilities, as well as roads and streets, overburdened. The need will be for financial assistance in the construction and early operation phases of energy development.

Projected coal mining would contribute in excess of 513 million tons of coal annually by the year 2000, with exports representing 87 percent of this. About 80 percent of the exports would occur by rail and 20 percent by slurry line. Railroads are expected to have more than 100 million tons of capacity by the year 2000, but under a low-conversion regional policy they would be hauling Montana coal over Wyoming lines. This would increase pressures for slurrying Wyoming coal. At least one slurry line appears essential to meet recommended export goals by 1985, with subsequent slurry lines scheduled to accommodate events of the future as they unfold. Export by slurry would involve less regional demand for water than would the processing of this coal regionally for export as electricity or gas.

Other effects placed in perspective by table 66 show 4 structural works benefiting some 1,805 acres of urban area and 20,000 people. An additional 320,000 acres would benefit from reservoirs and other protection. Aside from possible benefits of flood plain management, these provisions should reduce flood losses by about $700,000 per year. Improved yields from both nonirrigated and irrigated agricultural lands show some deficiency but an adequate response to food and livestock feed requirements of the region.

Fishing, hunting, and outdoor recreation show some regional shortfalls, but a substantial potential to respond to increased day use needs by the year 2000. Locally, significant shortages for most activities are indicated presently and are showing increases through the year 2000, particularly beyond 1985.

There can be wide speculation for the sharing of basic responsibility for costs involved in the recommended plan. Based on prevailing practice, table 66 shows the possible outlooks for Federal and non-Federal costs. These must be considered only as general determinations, but of the total cost of nearly $1.2 billion for plan components, the funding could be about 30 percent Federal and 70 percent from non-Federal sources. Excluded are private coal industry investments expected to exceed $6.0 billion.

CHAPTER 9

RECOMMENDATIONS FOR PLAN IMPLEMENTATION

Summary of Results

The recommended plan shown in chapter 7 contains an array of elements directed at meeting the study area's needs. Several functional areas of the plan, however, do not meet the identified remaining needs. An example is in the area of flood and erosion control. Other functional areas of the plan evaluate the contribution this area would make to national needs, as in the development of energy resources. This plan and the associated recommendations do, however, represent an economic and environmental balance based on the best available information and judgment of the planning participants.

Plan Implementation

To implement elements of the recommended plan, Federal, State, and local entities will have to work together with State and Federal legislative bodies and private individuals and organizations toward that end.

Near-term Implementation

Those plan elements which are ready for construction are undergoing detailed planning to prepare them for construction as shown in table 83. The agency responsible for initiating a feasibility study is also shown.

Legislative Action

Several modifications or additions to State and Federal laws and policies are recommended under the various functional areas. These recommendations are intended to suggest courses of action which will further water resources management on a coordinated basis.

Scheduling

Scheduling of the recommended plan elements is an important part of plan implementation. The schedule presented in table 83 provides a unified suggested approach for implementing the recommended plan.

Table 83
Implementation Schedule for Recommended Plan

Plan Element	Action Required: Construction	Action Required: Legislation or Policy	Action Required: Study	Lead Agency	Implementation Period: By 1985	Implementation Period: By 2000
Montana Areawide						
Revision in Federal Laws, Policies, or Priorities						
1. Quantification of Indian reserved rights			X	USDI	X	
2. Adoption of a national energy conservation program		X		Congress	X	
3. Development of renewable energy resources program		X		Congress	X	
4. Audit stripmine reclamation research			X	GAO	X	
5. Mineral ownership exchanges			X	USDI	X	
6. Evaluate streambank protection		X		Congress	X	
7. Develop Broadview-Wheat Basin Waterfowl refuges			X	FWS	X	
8. Assure Federal water planning agencies participate in level B or similar planning efforts		X		WRC	X	
State Legal and Institutional Changes						
1. Selection and evaluation of off-stream storage sites			X	Montana	X	
2. Planning for rural domestic water in eastern Montana			X	Montana	X	
3. Reconsider present constraint on slurry lines as		X		Montana Leg	X	
4. Yellowstone River remains free flowing		X		Montana Leg	X	
5. Classification of streams		X		Montana Leg	X	
6. Identify and protect archaeological and historical sites		X		Montana Leg	X	
Wyoming Areawide						
Revision in Federal Laws, Policies, or Priorities						
1. Provide additional funding for land conservation		X		Congress	X	
2. Adequate funding for land conservation and livestock water improvements on National Resource Lands		X		BLM	X	
3. Joint survey and study of unique areas			X	HCRS	X	
4. Develop uniform method of inventorying recreation resources and capabilities		X		USDI-USDA	X	
5. Amend section 7 of the Federal Water Project Recreation Act (79 Stat 213)		X		Congress	X	
6. Improve systems for collection of basic data on nonpoint-source pollution		X		Congress	X	
7. Increase funding in the wastewater construction grants		X		Congress	X	
8. Accelerate programming acquiring environmental base data		X		All Agencies	X	
9. Develop environmental projections under various assumptions about economic variables			X	All Agencies	X	

State Legal and Institutional Changes				
1. Rehabilitation of canals		X	Wyoming	X
2. Increased efficiency of irrigation water use	X		Wyoming	X
3. Social losses resulting from conversion of rangeland to cropland		X	Wyoming-USDA	X
4. Provide minimum practicable daily and seasonal fluctuation in reservoirs	X		Wyoming Leg.	X
5. Authorize State Engineer to license well drillers	X		Wyoming Leg	X
6. Contract for surplus water available in existing Federal reservoirs	X		Wyoming Leg	X
7. Analyze adequacy of all municipal water supplies and develop plans		X	Wyoming	X
8. Analyze with South Dakota potential use of Keyhole Reservoirs		X	Wyoming-South Dakota	X
9. Amend Wyoming Industrial Plant Siting Act	X		Wyoming Leg	X
10. Resolution of Article X, Yellowstone Compact	X		Wyoming Leg	X
11. Establish utility corridors	X		Wyoming Leg	X
12. Intensify research for rehabilitation of stripmined lands		X	Wyoming	
13. Establish air-monitoring network		X	Wyoming	X
14 Develop and implement a plan to reduce energy use		X	Wyoming	X
15. Land use planning		X	Wyoming	X
16. Require permits for stream channel modification	X		Wyoming Leg	X
17. Identify and publicize potential flood hazard areas	X		Wyoming Leg	X
18. Provide instream flow as a beneficial use	X		Wyoming Leg	X
19 Identify and preserve critical aquatic and wildlife habitats	X		Wyoming Leg	X
20. Establish a stream classification system	X		Wyoming Leg	X
21. Designate Wind River Canyon, a unique archaeologic area	X		Wyoming Leg.	X
22. Provide for full disclosure of environmental impacts of actions for other than federally funded developments	X		Wyoming Leg	X
North Dakota Areawide				
Revision in Federal Laws, Policies, or Priorities				
1 Accelerate ongoing comprehensive studies of potentially irrigable land	X		USDI-USDA	X
2. Accelerate research on cropping and tillage practices	X		USDA	X
3. Management of rangeland to encourage the maintenance and protection of native grasslands	X		USDI-USDA	X
4 Return a fair profit over costs to producers of grain and livestock	X		USDA	X
5. Develop pollution standards for all toxic materials emitted from coal conversion facilities	X		EPA	X
6. Increased research on rehabilitation of strip mined lands	X		USDA	X
7. Increased research on renewable resources for energy use	X		DOE	X

Table 83, Continued
Implementation Schedule for Recommended Plan

Plan Element	Action Required: Construction	Action Required: Legislation or Policy	Action Required: Study	Lead Agency	Implementation Period: By 1985	Implementation Period: By 2000
8. Funding for streambank protection		X		Congress	X	
9. Survey of historic, archaeological, and other unique areas			X	HCRS	X	
10. Develop uniform method of inventorying recreation resources and capabilities		X		USDI-USDA	X	
11. Expand and maintain a comprehensive water quality monitoring network		X		Congress	X	
12. Develop environmental projections under various assumptions about economic variables			X	All Agencies	X	
13. Accelerate programs in acquiring environmental base data			X	All Agencies	X	
14. Expand funding for air quality sampling network		X		EPA	X	
State Legal and Institutional Changes						
1. Require a certificate of soil on water compatibility for irrigation		X		North Dakota Leg.	X	
2. Agricultural lands protection act		X		North Dakota Leg.	X	
3. Limiting size of irrigation water permits			X	SWC	X	
4. Low interest loans for agricultural processing plants			X	North Dakota Leg.	X	
5. Land use planning			X	SP	X	
6. Preservation of public conservation investments			X	Universities	X	
7. Reservation of water for future use			X	SWC	X	
8. Reexamine State water allocation			X	SWC	X	
9. Strengthen water rights monitoring program		X		SWC	X	
10. Strengthen land reclamation law		X		North Dakota Leg.	X	
11. Enact surface owners protection act		X		North Dakota Leg.	X	
12. Enact industrial development tax		X		North Dakota Leg.	X	
13. Accelerate flood plain survey		X		SWC	X	
14. Provide instream flow as a beneficial use		X		North Dakota Leg.	X	
15. Establish a ground water quality and quantity surveillance and data reporting program		X		North Dakota Leg	X	
16. Control and monitor instream sediment		X		S.H	X	
17. Assessment of public proposals having significant impact on the environment		X		North Dakota Leg.	X	
Upper Yellowstone, Montana						
Multipurpose projects						
Flathead Creek Project		X		SCS		X
Pryor Creek Project		X		SCS		X
Agriculture (Irrigation)						
Whitehorse Bench Unit		X		USBR		X
Huntley South Unit		X		USBR		X
Seven Mile-Sitting Bull Unit		X		USBR		X

Accelerated land conservation measures		X		SCS, FS, BLM	X	
Rehabilitation of Headwater Basin of Shields River			X	SCS	X	
Streambank erosion						
Streambank Greenbelt Program			X	Montana (SCS)	X	
Fish and wildlife						
Removal of fish spawning barriers—Park County	X		X	Montana	X	
Flow regimen improvement of tributary streams above Livingston			X	Montana	X	
Antelope Creek storage			X	FWS	X	
Management of Yellowstone River islands to improve goose and wildlife habitat		X		FWS, Montana	X	
Wheat Basin and Broadview wildlife refuges			X	Montana		X
Classify the Beartooth and Absaroka primitive areas as a wilderness area			X	FS	X	
Instream flows reservations		X		FWS, MDFG, MDHES	X	
Outdoor recreation						
Wild, scenic, and recreational rivers (Yellowstone, Boulder, Shields, Stillwater)		X		NPS, Montana	X	
Lower Yellowstone, Montana						
Agriculture (Irrigation)						
Conns Coulee Unit			X	USBR		X
Fox Creek South Unit			X	USBR		X
Hay Creek Unit			X	Montana		X
Forsyth Unit			X	Montana		X
Fallon Bench			X	Montana		X
Broadview Bench Unit			X	Montana		X
War Dance Unit			X	Montana		X
Seven Sisters Unit			X	USBR		X
Energy industry (coal)		X		Montana	X	
Accelerated land conservation measures		X		SCS, FS, BLM	X	
Streambank erosion						
Streambank Greenbelt Program			X	Montana	X	
Fish and wildlife						
Instream flows reservations		X		FWS, MDFG, MDHES	X	
Outdoor recreation						
Wild, scenic, and recreational rivers (Yellowstone)		X		NPS	X	

Table 83, Continued
Implementation Schedule for Recommended Plan

Plan Element	Construction	Action Required Legislation or Policy	Study	Lead Agency	Implementation Period By 1985	Implementation Period By 2000
Clarks Fork-Bighorn, Montana						
Multipurpose projects						
Elbow Creek Project			X	SCS		X
Blue Water-Five Mile Creek Project			X	SCS	X	
Agriculture (Irrigation)						
Wyola-Lodge Grass Canal			X	SCS		X
Long Otter and Gas Field Pumping Unit			X	SCS		X
Hardin Unit			X	USBR		X
Accelerated land conservation measures		X		SCS, FS, BLM	X	
Streambank erosion						
Streambank Greenbelt Program			X	Montana, SCS	X	
Fish and wildlife						
Instream flows reservations		X		FWS, MDFG, MDHES	X	
Outdoor recreation						
Wild, scenic, and recreational rivers (Bighorn, Clarks Fork)		X		NPS	X	
Hydroelectric power						
Yellowtail Afterbay powerplant (II MW)			X	USBR	X	
Preservation						
Classify the Beartooth and Absaroka primitive areas as a wilderness area			X	FS	Implemented	
Tongue and Powder, Montana						
Multipurpose projects						
Tongue River Reservoir modification			X	Montana	X	
Energy industry (coal)		X		Montana	X	
Accelerated land conservation measures		X		SCS, FS, BLM	X	
Flood control						
Miles City Levee			X	CE	X	
Streambank erosion						
Streambank Greenbelt Program			X	Montana, SCS	X	

Fish and wildlife						
Instream flows reservation		X		FWS, MDFG, MDHES	X	
Outdoor recreation						
Wild, scenic, and recreational rivers (Tongue)		X		Montana, SCS	X	
Wind-Bighorn-Clarks Fork, Wyoming						
Multipurpose projects						
Upper Beaver Creek			X	SCS		X
Crow Creek Project			X	SCS	X	
Sand Mesa Project	Under Construction			Wyoming	Under Construction	
Buffalo Bill Reservoir Enlargement			X	USBR	X	
Nowood River Project			X	SCS		X
Cyclone Bar Project			X	SCS		X
Off-stream storage Clarks Fork Basin			X	USBR		X
Sunlight-Crandall Basin			X	FS		X
Agriculture (Irrigation)						
Hidden Valley Project			X	SCS	X	
Kirby Draw Project			X	Wyoming	X	
Muddy Ridge Area			X	USBR	X	
Taylor-Dutch Flats Project			X	SCS	X	
Banjo Flats Project			X	Wyoming		X
Cody Canal Rehabilitation			X	SCS	X	
Crooked Creek Project			X	SCS		X
Gooseberry Creek Project			X	SCS	X	
Greybull Flat Unit			X	USBR		X
Lower Greybull River			X	SCS		X
Lakeview Canal Rehabilitation			X	SCS		X
Lateral H-103 improvement			X	SCS	X	
Lateral R-9N improvement	Under Construction			SCS	Under Construction	
Sage Creek-Pryor Mountain			X	SCS		X
Lower Shell Creek Project			X	SCS	X	
Polecat Bench			X	USBR	X	
Shoshone Extensions Unit-south			X	Wyoming, USBR		X
McCullough Section			X	Wyoming, USBR		X
Sage Section			X	Wyoming, USBR		X
Sidon Canal Rehabilitation			X	SCS		X
Westside Irrigation Project			X	Wyoming	X	
Badger Basin Unit			X	USBR		X
Accelerated land conservation measures		X	X	SCS, FS BLM	X	
Outdoor recreation						
Popo Agie River		X		FS, Wyoming		X
Wind River		X		HCRS		X
Bighorn River		X		HCRS	X	
North Fork Shoshone River (component 1)		X		FS	X	
North Fork Shoshone River (component 2)		X		Wyoming	X	
Porcupine Creek		X		FS, BLM	X	

Table 83, Continued
Implementation Schedule for Recommended Plan

Plan Element	Action Required: Construction	Action Required: Legislation or Policy	Action Required: Study	Lead Agency	Implementation Period: By 1985	Implementation Period: By 2000
Shell Creek		X		FS	X	
Tensleep Creek-West Tensleep		X		FS, Wyoming	X	
Clarks Fork River (component 1—component 2—component 3)		X		FS, Wyoming	X	
Preservation						
Cloud Peak primitive area		X		HCRS	X	
High Country Lakes preservation		X		FS	X	
Northeast Wyoming						
Multipurpose projects			X	SCS	X	
Cabin Creek Project			X	SCS		X
South Tongue Watershed			X	Wyoming	X	
Kaycee Project			X	SCS	X	
Middle Fork Crazy Woman			X	Wyoming	X	
Northeast Wyoming water project						
		X		Wyoming	X	
Energy industry (coal)						
		X		SCS, FS, BLM	X	
Accelerated land conservation measures						
			X	CE	X	
Flood control (Sheridan)						
			X	FWS, Wyoming	X	
Fish and wildlife (instream flow needs, all rivers)						
Outdoor recreation (scenic recreation river)			X	FS	X	
Tongue River, source to national forest boundary						
Tongue River, national forest boundary to Montana-Wyoming border			X	Wyoming	X	
North Dakota Tributaries						
			X	USBR	X	
Multipurpose projects		X		North Dakota	X	
(Rural, domestic, municipal water supply)		X		SCS, FS, BLM	X	
Energy industry (coal)			X	SCS	X	
Accelerated land conservation measures						
Flood control (Hazen)			X	CE	X	
Streambank erosion (Missouri-Yellowstone-Knife historical site)			X	FWS	X	
Fish and wildlife (instream flow needs, all rivers)			X	NPS, North Dakota	X	
Outdoor recreation (scenic recreation rivers, Yellowstone,			X	CE	X	
Knife, Heart, Cannonball, Missouri)			X	North Dakota	X	
Hydroelectric power (Garrison Dam)						
Preservation (unique woodland areas)						

RECOMMENDATIONS

Agriculture

Agriculture is the primary industry in the study area. Continuation of agriculture in its present form in the study area was the primary concern of the citizen participants in this study.

Montana

RECOMMENDATION 1

The appropriate legislative and approval authority should be urged so that.

1. *Federal, State, and local agencies should continue to support and provide technical assistance to landowners in identifying and applying good land and water conservation practices.*

2. *Strategic off-stream storage sites, should be selected and evaluated at a feasibility level to see if such projects can be supported by potential users in the future*

North Dakota

RECOMMENDATION 1

The North Dakota State Legislature should:

1. *Enact legislation to require a certificate of soil and water compatibility before the Water Commission issues a conditional irrigation permit*

2. *Enact an agricultural lands protection act that would:*

   a. *Save a landowner from being forced out of agricultural production and into a land transition because the land becomes assessed as potential industrial or suburban land, such as the Williams Act in California, and*

   b. *Provide for a land tenure program that could be used by those desiring to facilitate inheritance of family unit farms, such as the land tenure laws of the Province of Saskatchewan, Canada, and*

   c. *Provide compensation for all oilwell sites during all the years they are not in agricultural production*

   d. *Protect the prime agriculture land and lands of statewide importance*

RECOMMENDATION 2

The State Water Commission is encouraged to continue investigating the advisability of limiting the size of acreage for which irrigation water permits can be obtained

Wyoming

RECOMMENDATION 1

The appropriate legislative and approval authority should be urged to.

1. *Identify and perform prefeasibility analysis of canal systems in the planning areas to identify rehabilitation and development potentials and needs*

2. *Have the State Extension Service and agricultural organizations take the lead in promoting increased efficiency of irrigation water use by such means as sprinkler or trickle application, better control and carriage system, improved management etc.*

3. *Help minimize social losses resulting from conversion of rangeland to cultivated agriculture and to provide policy guidance a research study be undertaken cooperatively by State and Federal agencies. This study should be directed toward*

   a. *identifying the location and extent of such conservation disinvestments*

   b. *identifying the conditions under which these disinvestments are induced (e.g. price instability) and*

   c. *specifying the types of policies and programs that would encourage and preserve public conservation investments*

North Dakota, continued

RECOMMENDATION 3

The appropriate legislative and approval authority should be urged so that:

1. *The Soil Conservation Service, the Bureau of Reclamation, and the NDSU Soils Department can accelerate the ongoing comprehensive studies of potentially irrigable land.*

2. *State and Federal research agencies can accelerate research on cropping sequences and tillage practices with specific aim of reducing acreage of bare soil.*

3. *State universities, Federal and State agencies involved with agriculture can better coordinate their recommendations on cropland management. Special consideration should be given to their management features that promote organic farming research, improved erosion control, water quality maintenance, energy conservation, and economic productions.*

4. *Management of State and Federal rangelands can encourage the maintenance and protection of native grasslands, and discourage the conversion of these vegetation communities to other cover types.*

5. *Schemes which facilitate absentee-syndicate type land purchasing can be outlawed, and family farms be encouraged through incentives like tax credits and loan programs, particularly to aid small farmers or beginning farmers. A graduated land tax system would also inhibit oversize acreages.*

RECOMMENDATION 4

The North Dakota Study Team for the Yellowstone Level B Study:

1. *Recommend that farm operators diversify their operations in order to stabilize their incomes.*

2. *Recommend that the U.S. Department of Agriculture urge the enactment of legislation which will return a fair profit over costs to producers of grain and livestock.*

3. *Urge the granting of low interest loans by the Bank of North Dakota for the establishment of processing plants of our agricultural products.*

4. *Urge the North Dakota Business and Industrial Development Commission to support the development of our agriculturally related recreation and leisure potential through such enterprises as: retirement and guest homes, horse and dude ranches, riding schools, raising game birds, fishing ponds, and retirement farms and communities.*

5. *Urge the State planning agencies to study the problem of urban sprawl and recommend.*

   a. *guidelines for appropriate zoning authorities or*

   b. *State legislation that will provide for orderly growth.*

6. *Recommend that the U.S. Department of Agriculture farm payments to farm operators be left at their present levels.*

7. *Recommend that a research study be undertaken by the State universities and the ESCS to identify*

   a. *the location and extent of conservation disinvestments.*

   b. *the conditions under which these disinvestments are induced (e g , price instability), and*

   c. *the specification of the types of policies and programs that will encourage and preserve public conservation investments*

8. *Recommend that NDSU research and institute additional programs that would help protect and enhance dryland agriculture*

Municipal, Rural Domestic, and Livestock Water

There are many opportunities for new water developments in the study area and there are many areas that need new or supplemental supplies, generally in relatively small amounts. In most cases, water distribution is the major problem.

Montana

RECOMMENDATION 2

The appropriate legislative and approval authority should be urged so that:

1. *Indian and Federal reserved water rights are equitably quantified at the earliest possible date.*
2. *State, county, and local agencies are encouraged to be responsible for providing or regulating domestic water supplies in the Yellowstone River Study Area to take advantage of provisions of the Federal Safe Drinking Water Act, P.L. 93-523, in order to receive cost-sharing and other benefits that would aid in improving domestic water quality*
3. *Programs are accelerated to aid in the discovery and delivery of water to water-short communities in eastern Montana.*

North Dakota

RECOMMENDATION 5

The North Dakota State Water Commission should:

1. *Develop rules and regulations by which State and local units of government could request the water commission to reserve, for their future use, specific amounts of water for specific purposes. These reservations would become part of a comprehensive water plan. In addition, all permits to be granted should conform to a State water plan.*
2. *Sponsor public proceedings at which current methods of water allocation be reexamined in light of contemporary and future needs. This would include:*
   a. *Reevaluation of the Doctrine of Prior Appropriation and the Doctrine of Appurtenancy, as related to land and water speculation, exploitation, and conservation factors.*
   b. *Discussion of alternative methods of water allocation such as legislated preferential use or administrative allocations.*
   c. *Limited time permits and limited marketability or transferability of water rights.*
3. *With appropriate funding strengthen its monitoring program for all water diverters.*

RECOMMENDATION 6

The North Dakota Study Team for the Yellowstone Level B Study, strongly supports the U.S. Bureau of Reclamation rural municipal water study. We suggest that the study be limited to rural domestic, municipal, light industrial and recreation uses. Full coordination between this study and the North Dakota State Water Commission study is also recommended.

Wyoming

RECOMMENDATION 2

The Wyoming State Legislature should pass legislation that would:

1. *Provide a legal basis for management of water levels in newly built reservoirs to provide minimum practicable daily and seasonal fluctuation in reservoir (and streamflow) levels where minimum pool levels are a basis for benefits.*
2. *Authorize the State Engineer to license well drillers in the State of Wyoming.*
3. *Provide authority to an appropriate regulatory agency to require that State permits be obtained before drill holes are sunk in the exploration for or development of locatable and leasable minerals*
4. *Provide authority to require an individual or entity that disrupts an aquifer to carry the burden of proof for non-interference if a permitted well in the area is adversely affected.*

RECOMMENDATION 3

The appropriate legislative and approval authority should be urged so that

1. *The State of Wyoming can continue and expand its role as caretaker of the State's water by:*
   a. *Contracting for the use and management of any surplus water available to the State in existing Federal reservoirs – specifically Keyhole, Boysen, and Buffalo Bill reservoirs and any others that may be built in the future.*
   b. *Refining the plans contained herein to make use of Wyoming's Yellowstone Compact to most*

equitably serve all needs, and provide the authority and funding for investigation in detail and design, construction, and operation of a reservoir system and such other facilities as may be necessary to optimize use of the area's water and land needs. Specifically, the State should take the lead in cooperation with local interests, the Soil Conservation Service, the Bureau of Reclamation, and others in developing new plans for water supply and use in the Cody area

c. *Investigating the opportunities for the beneficial use of cooling water supplies from industrial power plant systems where available*

2. *The State can analyze the adequacy of all municipal water supplies in Wyoming for their ability to provide the quantity and quality of water that may be needed in the years ahead, using data assembled by county planning organizations where such information is available*

3. *State, county, and local agencies responsible for providing or regulating domestic water supplies can follow up on the State analysis by developing plans for making needed improvements. The agencies could take advantage of provisions of the Federal Safe Drinking Water Act P.L. 93-523 for cost share funding and other benefits in improving quality of domestic water*

4. *The States of Wyoming and South Dakota can reanalyze potential uses of Keyhole Reservoir with a view toward Wyoming's acquiring title to unused and unneeded South Dakota rights to permit better use of the resource, for game and fish management, M&I water, irrigation, or other purposes*

5. *The Wyoming Industrial Plant Siting Act can be amended to authorize the Wyoming Industrial Siting Council to require, as a part of its permit procedures, that new industries make, or participate in making, water available for affected municipalities when, in the Council's judgment, the population increases associated with the industry create an undue burden on the municipal water supply*

Energy Industry

The expansion of uranium and coal exploration and mining in the study area could create major impacts unless careful precautions are taken.

Montana

RECOMMENDATION 3

The Congress is urged to:

1. *Adopt a national energy conservation program designed to reduce current and projected energy demands.*
2. *Provide additional funds for development of innovative renewable energy resources.*

RECOMMENDATION 4

The Montana State Legislature should reconsider the use of water in interstate slurry pipeline operations. Such a mode of transportation could supplement rail traffic in the export of Montana coal to the demand regions.

RECOMMENDATION 5

The appropriate legislative and approval authority should be urged so that:

1. *The General Accounting office can audit federally funded strip mine reclamation research projects. The object of this audit would be to identify duplication of effort and note areas not being adequately studied.*
2. *An evaluation study and public information program can be undertaken by the Department of the Interior to illustrate opportunities and techniques for making mineral ownership exchanges between Federal and State and private landowners in order to mitigate potential environmental problems associated with coal production.*

North Dakota

RECOMMENDATION 7

The Congress and the North Dakota Legislature are urged to enact legislation to require the appropriate agencies to develop pollution standards for all of the toxic materials emitted from coal conversion facilities, including the trace minerals.

RECOMMENDATION 8

The North Dakota Legislature should:

1. *Require a front-end fee to catch up on the air pollution and reclamation research lag for such research from all applicants for siting and water use permits with any plans that would involve emissions into the air or the disturbance of the ground surface.*
2. *Enact a land reclamation law that would:*
   a. *Redeem reclamation bonds only after productivity comparable to that before the topsoil was disturbed has been demonstrated for three consecutive years.*
   b. *Increase the required reclamation bonds to 30 percent greater than the estimated costs of reclamation and provide funds for adequate onsite inspection.*
   c. *Base the issuance and renewal of later mining permits on the applicant's previous performance in land reclamation and pollution control, and*
   d. *Provide for a committee of landowners in the mining area to work with the Public Service Commission in developing the mining and reclamation plan.*

Wyoming

RECOMMENDATION 4

The Wyoming State Legislature should pass legislation that would:

1. *Press for resolution of Article X of the Yellowstone Compact, with a view toward permitting each State to use its allocated share of available water supplies outside the Yellowstone Basin hydrologic boundaries if it considers such action desirable.*
2. *Take the lead in working with counties, cities, private interests, and Federal agencies in establishing utility corridors to serve as many service needs as practicable, and in providing legislative or administrative insurance that such corridors be used.*

RECOMMENDATION 5

The appropriate legislative and approval authority should be urged so that:

1. *Esthetics would be a major consideration in development of all facilities, and particularly the large structures associated with energy conversions and transportation:*
   a. *Power lines that blend into the landscape, contour around hills rather than across the skyline are placed in utility corridors where practicable, and are constructed in a manner that minimizes impact on the surfaces (such as with helicopters in rough country).*
   b. *Aqueducts and pipelines are buried where practicable. Revegetation of slopes if open cut, allowance of wooden crossings for big game when necessary, avoidance of building with steep sides to keep from trapping big game animals, etc.*

3. *Enact a surface owners' protection law that would:*

   a. *Require a surface owner's consent before mining*

   b. *Spread the tax burden to subsurface owners by enacting a minimum holding tax to be paid by mineral holders.*

4. *Enact an industrial development tax that would:*

   a. *Provide front-end funds for adequate community health, welfare, housing, transportation law enforcement, recreational, and educational services for the people of areas impacted by mining*

   b. *Provide adequate funds for the social and economic rehabilitation of people and communities following the demise of the mining operation, and*

   c. *Provide funds for rural and municipal water supplies.*

5. *Enact laws denying eminent domain for the erection of transmission lines for the exporting of electric power generated in North Dakota and for the construction of coal slurry pipelines for the interstate movement of coal.*

6. *Enact a resources planning law that would provide funding for open citizen participation*

RECOMMENDATION 9

The appropriate legislative and approval authority should be urged so that.

1. *Energy industry and government organization, such as agricultural experiment stations, intensify research into improved methods for rehabilitation of strip-mined lands Industry must continue the major active role in surface rehabilitation*

   c. *Roads that minimize cuts are placed across rather than parallel to rivers and adjoin valleys where practicable.*

   d. *Fences that blend into landscape, minimize damages to terrain during construction are designed to allow passage to wildlife.*

   e. *Plant construction that minimizes visual impacts are located in good air dispersal areas, are located on sites where conflicts with other interests are at a minimum, and do not endanger the quality of unique resources*

2. *In cases where developments in one State or county impact consequentially on another State or county, the Federal coal royalty money would be redistributed to the impacted area, as well as the mining area, in some reasonable sharing arrangement*

3. *State and Federal agencies would administer coal land leasing to specifically prohibit mining in such areas as*

   a. *designated or recommended parks monuments, or historic areas*

   b. *alluvial valley floors*

   c. *coal beds that are major aquifers as related to other aquifers on the same depth range in the area, and*

   d. *areas within one mile of established town or corporate limits*

4. *Air pollution controls covering all types of pollutants (particulates, sulfur oxides nitrogen oxygen carbon monoxide, and nonmethane hydrocarbons) would be required on all plants that emit more than 1,000 tons of total pollutants per year using the best technology available at the time of purchase of the plant equipment*

5. *Energy industry and government organizations such as agricultural experiment stations would intensify research into improved methods for rehabilitation of stripmined lands*

North Dakota, continued

2. *Further research is conducted on the effects of atmospheric emissions from coal-fired generation facilities on agricultural crops, shelterbelts and other woodland vegetation, and native prairie. This research should include both those emissions controlled by air quality standards and emissions not currently regulated. Where such research established substantial damage to vegetation, air quality standards should be revised to eliminate these effects.*

3. *Mining of alluvial valleys is regulated*

4. *A larger percentage of the Department of Energy research budget would go to renewable resources such as solar, wind, and conversion of excess grain*

5. *Research that attempts to place a dollar value on some environmental factors such as visual pollution from power lines is encouraged and funding for such research needs is expanded.*

6. *The number, height, and size of plants in an area is limited to meet environmental standards.*

7. *Counties and city governments are encouraged, if necessary, to enact and enforce zoning laws and regulations to control direct use of land for mining and associated people impacts such as housing, water supplies, etc.*

Wyoming, continued

6. *The State of Wyoming would establish a permanent air-monitoring network to provide data for use in future studies of active and potential pollution sources, and to identify changes in air quality whenever they occur*

7. *Mine reclamation efforts would be continually monitored and pertinent laws updated as appropriate to insure that reclamation is provided and is effective, but that excess costs and unnecessary delays are not incurred merely to meet requirements that were imposed prior to the accumulation of factual information on possible reclamation results.*

8. *The State would:*

   a. *develop and implement a plan to reduce 1975-2000 energy use by at least 25 percent below what it would be if rates of per capita growth continued as they have in the past, and*

   b. *lend its full support to similar conservation efforts on a national scale.*

9. *Counties and city governments would enact and enforce zoning laws and regulations to control use of land for subdivisions, mining, and other purposes, and for accommodation of associated people impacts.*

Land Conservation Measures

Because of the importance of agriculture in the study area land conservation measures are of concern.

Montana

RECOMMENDATION 6

The appropriate legislative and approval authority should be urged so that:

1. *Overutilized private and public lands in the Shields River drainage would be inventoried and then managed to achieve rehabilitation of soils, vegetation, and water quality. Organizations such as the Soil Conservation Service and Forest Service should contribute to the effort within the scope of their responsibilities.*
2. *The Soil Conservation Service and other State and Federal land management agencies would formulate and implement best management practices throughout the Yellowstone Basin to reduce man-caused sediment and related problems*

North Dakota

RECOMMENDATION 10

The appropriate legislative and approval authority should be urged so that.

1. *Landowners are encouraged to preserve existing shelterbelts through educational efforts by extension service, environmental groups, SCS, and others as appropriate*
2. *Federal, State, and local agencies continue to provide technical and financial assistance to landowners in identifying and applying appropriate land and water conservation practices*
3. *Bureau of Land Management carry out land conservation measures and upgrading of livestock water impoundments on national resource lands as part of ongoing agency program*

Wyoming

RECOMMENDATION 6

The Congress is urged to provide additional funding for land conservation. Programs should be accelerated on all lands not adequately treated as part of ongoing agency programs.

RECOMMENDATION 7

The appropriate legislative and approval authority should be urged so that

1. *Landowners are encouraged to improve and augment land and water conservation practices through educational efforts by extension service environmental groups, etc Federal State and local agencies should continue to provide technical and financial assistance to landowners in identifying and applying appropriate land and water conservation practices*
2. *Land conservation measures and upgrading livestock water improvements on national resource lands are adequately funded and carried out by the Bureau of Land Management as part of their ongoing agency program*

Flood Control and Streambank Erosion Control

Installation of selective river management techniques along the Missouri River and Yellowstone River using variations of several different types of structural bank protection measures was authorized by the Streambank Erosion Control Evaluation and Demonstration Act of 1974, plus amendments. Increased flood plain management and upstream land treatment are two potentials for reduction of the study areas' flood damages.

Montana

RECOMMENDATION 7

The Congress is urged to evaluate the installation of selected river management techniques using variations of several different types of structural bank protection measures at 24 key locations between Intake, Mont., and the mouth of the Yellowstone River. These measures should be coordinated with other Federal and State agencies to assure that existing recreational, fish and wildlife, and esthetic resources are not adversely affected.

RECOMMENDATION 8

The appropriate legislative and approval authority should be urged so that:

1. *State and Federal land management agencies, in conjunction with private landowners, would institute best management practices in order to retard runoff and reduce flood hazards throughout the study area.*
2. *City and county governments would continue to improve flood preparedness and act to insure adequate and operable flood warning systems.*
3. *A nonstructural approach to the flooding problem (e.g., flood plain zoning and flood insurance programs) is recommended. The Corps of Engineers' West Billings flood control project is not included in the plan elements.*

North Dakota

RECOMMENDATION 11

The Congress is urged to continue funding for streambank protection measures at 21 key locations along the Missouri River between Garrison Dam and Lake Oahe and at 24 key locations along the Yellowstone River between Intake, Mont., and the mouth.

RECOMMENDATION 12

The appropriate legislative and approval authority should be urged so that:

1. *City, county, State Highway Department, and SCS will implement existing proposal for structural protection to town of Hazen from flood damage by Antelope Creek.*
2. *The Soil Conservation Service, land management agencies, and others as appropriate, including private landowners would review opportunities for upstream land treatment practices to reduce flood hazard throughout the study area.*
3. *County governments would improve flood preparedness under the umbrella of State Civil Defense or disaster organizations; and insure adequate flood warning systems.*
4. *Acceleration of the flood plain survey and flood plain delineation program administered by the State Water Commission would occur, and that this program would be expanded to include rural flood plains as well as urban areas.*
5. *Flood prone areas would be identified and used for flood tolerant uses while prohibiting development subject to flood damage.*

Wyoming

RECOMMENDATION 8

The Wyoming State Legislature should enact legislation that would:

1. *Require a permit before stream channel modifications could be undertaken.*
2. *Provide State cost-sharing funds to assist communities having suitable flood plain lands that could be developed for use as parks or other functions not easily damaged by flood, provided there is a demonstrated need for such developments.*
3. *Require all subdivisions outside established city limits to:*
   - a. *identify and publicize potential flood hazards and provide an acceptable flood management plan for the subdivision before a permit to construct can be issued, and*
   - b. *require subdividers in all areas to identify proposed water sources, including an identification of permits or water rights for surface water or ground water, and to identify a reasonable system for delivery of water under valid rights to the new subdivisions or declare on titles that no provision for the water rights has been made.*

RECOMMENDATION 9

The appropriate legislative and approval authority should be urged so that:

1. *Land management agencies and private interests would review opportunities for upstream land conservation practices to reduce flood damages throughout the study area and implement conservation measures that would reduce flood damages.*

2. *City and county governments would improve flood preparedness under the umbrella of State Civil Defense or disaster organizations, and take steps to insure adequate and operable flood warning systems and to educate the public to their use and significance.*

3. *Counties would adopt flood plain management regulations that would limit flood plain use to those compatible with the potential hazard and stream capabilities. Affected counties or other local entities that do not undertake an acceptable flood plain management program should pay the cost of State regulation thereof.*

Fish and Wildlife

A coordinated, comprehensive plan for the conservation, development, and management of the waters and related land resources in the Yellowstone Basin is a necessity if environmental objectives, including fish and wildlife, are to be given equal consideration with economic development. From the standpoint of fish and wildlife objectives, the foremost need is for environmental legislation at the State level.

Montana

RECOMMENDATION 9

The appropriate legislative and approval authority should be urged to:

1. *Further develop the Broadview-Wheat Basin wildlife refuges. Plans for improvement should reflect the potentials of the Billings Water/Calamity Jane Project.*

2. *Make a study to determine if the diversion structure in the Yellowstone River at Intake, Mont., should be modified to allow for passage of paddlefish. This could reduce the amount of water required for fish and wildlife needs in that reach of the river.*

3. *Make a study to locate and evaluate off-stream damsites in which water could be stored during periods of excess flow and released to augment the flow during the summer months. In a number of tributaries, trout habitat is severely limited by irrigation diversions in late summer. The proposed project on Shields River is an example (Antelope Creek Storage).*

North Dakota

RECOMMENDATION 13

The North Dakota State Legislature should provide legal recognition for instream flow as a valid, sustainable water right and specifically as a beneficial use, similar to provisions in the Montana State Water Law of 1973

Wyoming

RECOMMENDATION 10

The Wyoming State Legislature should pass legislation that would:

1. *Recognize minimum streamflow maintenance as a beneficial use of water, subject to the same appropriative procedures as other beneficial uses. This will not affect prior water rights.*

2. *Provide authority for an appropriate regulatory agency to adopt and enforce minimum flow regulations for selected streams, after due consideration of all potential and foreseeable beneficial uses of the streams.*

3. *Recognize fish, wildlife, and the general environment as important factors contributing to the general well-being of the State and Nation.*

4. *Identify and preserve critical aquatic and wildlife habitats.*

5. *Require mitigative and compensative measures to offset adverse fish and wildlife impacts of water resource developments.*

6. *Provide for matching funds as an incentive to encourage the inclusion of fish and wildlife enhancement features in project plans.*

7. *Authorize the Game and Fish Commission to participate as full partners in the planning, funding, construction, operation, and repayment of multipurpose water control projects where the owners of primary interest are local, State, or private entities.*

8. *Place the primary authority for management of all furbearing wildlife with the Wyoming Game and Fish Commission.*

9. *Enact a Fish and Wildlife Coordination Act requiring consideration of fish and wildlife resources and preparation of a plan to prevent or mitigate losses in issuance of State permits or expenditure of State funds on water and related land resource development projects.*

10. *Determine the economic, social, and other values of instream flows prior to further diversion or inundation of streams.*

RECOMMENDATION 11

The Wyoming Game and Fish Commission[1] *is urged to.*

1. *Continue its policy of acquiring public access to streams where needs have been identified*

2. *Undertake or oversee hydrologic or biologic studies where necessary to identify areas where minimum streamflows are inadequate during some part of the year, and to identify methods of providing needed instream flows*

[1] Several of the recommendations listed under Surface and Ground Water Law and Administration Water and Land Use Administration and Water Development and Management are important to Game and Fish Management

Outdoor Recreation

Recreation has long been considered and managed as an adjunct to other functions of land and water use. As a result, recreation and related environmental data for regional and river basin planning are not comparable to the data available for water development, flood control, and other purposes. In addition, considerable variation exists between States on recreation and related environmental data and objectives.

Montana

RECOMMENDATION 10

The Montana State Legislature should identify Montana streams of major significance and provide appropriate protection for those streams to supplement the National Wild and Scenic Rivers Systems.

North Dakota

RECOMMENDATION 14

The Congress should provide funding to the Department of the Interior and a planning grant to the North Dakota State Outdoor Recreation Agency to allow a joint survey and study of historic and archaeological, and other unique areas such as caves, badlands, and other geologic or scenic areas of special significance. Once data was collected, a policy for designation, management, and protection of the areas should be established.

RECOMMENDATION 15

The North Dakota State Legislature should provide funding and authorization to the State Parks and Recreation Department for implementation of a State Scenic and Recreational River System. The initial rivers designated for the system should include, but not be limited to, the Knife River (from Manning to the Missouri River), the Yellowstone River (from North Dakota-Montana border to the Missouri River), the Heart River (from Heart Butte Dam to the Missouri River), the Cannonball River (from the county road south of Shields to North Dakota bridge l806), and the Missouri River (from the Knife River confluence to Ft. Lincoln).

RECOMMENDATION 16

The appropriate legislative and approval authority should be urged so that:

1. *Federal, State, and private entities responsible for managing recreation areas would establish a uniform method of inventorying existing recreation resources, reporting use, and identifying recreational use capabilities. This system should be kept current and made available for all resources planning purposes.*

Wyoming

RECOMMENDATION 12

The Congress is urged to:

1. *Amend P.L. 83-566 to remove the restrictions on the number of sites eligible for Federal cost assistance relative to recreation and fish and wildlife uses.*

2. *Provide funding to the Department of the Interior and planning grants to the Wyoming Recreation Commission and the Department of Environmental Quality to allow a joint survey and study of unique areas such as caves, badlands, and other geologic or scenic areas of special significance. Once data are collected, a policy for designation, management, and protection of these sites should be established.*

3. *Amend Section 7 of the Federal Water Project Recreation Act (79 stat 213) to provide for broadened Federal assistance to States or other administering agencies for construction, expansion, operation, and maintenance of recreational facilities at Federal projects.*

RECOMMENDATION 13

The Wyoming State Legislature should enact legislation to establish a stream classification system that would identify streams of major significance for all uses including fish and wildlife, recreation, scenic viewing, and historical and unique values, and provide for permanent designation and State control of outstanding streams as wild, scenic, or other restricted-use areas. This procedure would supplement the National Wild and Scenic River Act by permitting the State to protect streams of less than national significance.

2. *Recreation resources including cultural, historical, and archaeological resources in North Dakota and adjoining States, would be utilized by recreationists considered to be nonresidents to the State or region. Therefore, a regional study should be initiated to identify nonresident demand of these resources in each of the States in the Missouri River Basin.*

3 *Various public entities would find a means to prevent the clearing of woodland so they may retain their values for recreation, esthetics, wildlife, etc.*

RECOMMENDATION 14

The appropriate legislative and approval authority should be urged so that:

1. *Recreation resources including cultural, historical, and archaeological resources in northwest Wyoming and adjoining areas, are utilized by many recreationists considered to be nonresidents to the region. A cooperative State-Federal regional study should be initiated to identify nonresident demand on these resources with an analysis of the point of origin of resource users.*

2. *A joint State-Federal effort is initiated to carry out total water management studies to improve management of State and Federal reservoirs and related river systems. These studies should consider recommendations for management of the water resources of the State for multiple uses, including recreation. Recommendations for improved recreation use of these water resources should result in the State accepting and carrying out a greater role in the operation and management of recreation lands and facilities at these water resources.*

3 *Federal, State, and private entities responsible for managing recreation areas establish a uniform method of inventorying and evaluating existing recreation resources, reporting use, and identifying recreational use capabilities. This system should be kept current and made available for all resource planning purposes.*

4 *The State would continue to develop State parks, using the established priority system, and insure that park uses are limited to recreational pursuits Areas that might be considered for State parks or Natural Beauty Area designation include the lower Clarks Fork Canyon, the Wind River Canyon, Devils Canyon, DeMasis Hot Springs, Spirit Mountain Caverns, and Thief Cave*

5. *The State actively would support winter recreation programs that are consistent with environmental values of the affected areas*

Wyoming, continued

6. *Local, State, and Federal agencies administering recreational areas would expand their operation and maintenance budgets to better handle increasing uses of developed facilities and dispersed-recreation areas. (For example, the study team recommends that the Forest Service keep the Sunlight Ranger Station open and provide related service on a year-round basis, or as a minimum through the hunting season.)*

7. *Appropriate State and Federal agencies would administratively limit use of off-road-vehicles on public land to established and designated roads or trails except that snowmobiles may be used in designated areas at specified times and official vehicles may be used for firefighting or other emergencies, at the discretion of the administering agency.*

8. *The Wind River Canyon between Boysen Dam and the Wedding of the Waters would be declared a unique geologic area, under the provisions of the State Environmental Quality Act, to insure that its scenic and educational values are not lost to vandalism or careless development.*

Water Quality Control

Surface water quality is a problem in some parts of the study area and it will become an increasingly more severe problem unless steps are taken promptly to prevent further quality deterioration. Point sources of pollution, such as sewage plant or industrial plant effluents, are amenable to identification and solution by current technology. Although such solutions are often very costly, they are generally being provided where required by private or public funds. Nonpoint sources of pollution are much harder to identify and correct. They involve erosion from agriculture or rangeland or other areas that result in sedimentation and eutrophication of streams and other water bodies. Their correction involves, to a large degree, improved management of resources. The effects of development on ground water are a concern in the study area and there is a need for additional investigation on this subject.

Montana

RECOMMENDATION 11

The appropriate legislative and approval authority should be urged so that Montana's water quality surveillance system is evaluated to see if it can meet the demands that will be placed on it with growth of the State's economy.

North Dakota

RECOMMENDATION 17

The North Dakota State Legislature should:

1. *Provide increased funds to establish a ground water quality and quantity surveillance and data reporting program. The Congress should provide funds to the Department of the Interior to cover the public lands.*

2. *Enact laws protecting all aquifers from disturbances, including seismographing, that would alter the present quality of the underground water except by a joint permit from the North Dakota State Water Commission and the North Dakota State Health Department*

RECOMMENDATION 18

The appropriate legislative and approval authority should be urged to:

1. *Enact legislation to provide adequate funding to expand and maintain a comprehensive water quality monitoring network*

2. *Enact legislation to provide funding to make a comprehensive study of stream degradation and reservoir eutrophication, using Patterson Lake as one testing site.*

3. *Provide the North Dakota State Health Department with appropriate legislative and approval authority to monitor and better control instream sediment*

Wyoming

RECOMMENDATION 15

Congress and the Wyoming State Legislature should:

1. *Provide funding to accelerate land conservation measures and other measures that have been shown as effective in controlling and improving water quality State funds should be used particularly on State-owned lands where erosion problems are significant.*

2. *Improve the system for collection of basic data on nonpoint-source pollution and pollution potentials, including irrigation*

3. *Provide education programs to explain proper management procedures to minimize salt, sediment, organic, and biological loadings in streams*

4. *Accelerate land conservation measures and other measures that have been shown effective in controlling and improving water quality*

5. *Increase funding in the construction grants program if municipal discharges are to meet the 1977 secondary standards. The high costs of sewage treatment facilities make it nearly impossible for many individual communities to totally fund such construction*

RECOMMENDATION 16

The appropriate legislative and approval authority should be urged so that.

North Dakota, continued

4. *Continue the study by the North Dakota State Health Department of the evaluation of the effects of farming practices on the air and water environment; establish limiting criteria on nutrients, pesticides, and herbicides; develop methods of on-farm retention of excessive sediment transport, and cooperate and participate in a multi-State program to control interstate pollution.*

Wyoming, continued

1. *The Soil Conservation Service, land management agencies, and private owners review opportunities for improved upstream land management and treatment practices in the study area as needed to reduce the severe siltation problems currently encountered in many streams.*

2. *Appropriate State and Federal agencies analyze potentials for use of vascular aquatic plants, land application of waste-treatment effluents, and other organic methods of making use of pollutants.*

3. *Wastewater planning for small communities in energy impact areas would include a program of septic tank control as an alternative to construction of a collection system and centralized treatment. Such control would influence design, construction, and maintenance of on-lot disposal systems. High densities, improper site selection, and improper installation are usually the cause of system failure and ground water pollution. A local level of control is needed to insure that regulations are properly enforced.*

4. *Attention to water quality control would be a part of the drilling-control recommendations included in other parts of this chapter. A major ground water quality concern raised by the "208" studies is the pollution/contamination caused by poor drilling practices occurring during the exploratory phase of mineral and coal development.*

5. *Innovative approaches to wastewater treatment such as, but not limited to, the use of aquatic plants, irrigation, and land application, would be investigated in terms of their suitability for circumstances existing in the study area. Those measures which prove feasible should be considered along with traditional treatment methodologies when evaluating the alternatives available.*

RECOMMENDATION 17

State and Federal agencies are urged to resolve conflicts between State Water Law and EPA discharge requirements where administratively possible, and recommend legislation to resolve or clarify apparent conflicts in pertinent laws.

Other Environmental Considerations

The effects of development on the environment is of concern in the study area. Recognizing this, and that environmental awareness necessitates additional education and research programs that address these concerns the following recommendations are made.

Montana

RECOMMENDATION 12

The Congress and the Montana State Legislature should be encouraged to fund needed environmental quality projects even though calculated benefit-cost relations are unfavorable.

RECOMMENDATION 13

The appropriate legislative and approval authority should be urged so that:

1. *The Water Resources Council is provided the authority to insure that all Federal water planning agencies, including those dealing directly with the environment, will actively participate in multipurpose planning efforts. State agencies that have responsibilities related to water resources should also be required to actively participate in State-Federal cooperative studies.*
2. *Significant archaeological and historical sites in the study area are identified and preserved.*
3. *The Yellowstone River would remain a free-flowing river*

North Dakota

RECOMMENDATION 19

The Congress is urged to:

1. *Enact appropriate legislation and funding for developing and publishing environmental projections under various assumptions about economic variables.*
2. *Not amend the Clean Air Act of 1970 to strip Indian tribes of their right to make redesignation requests.*

RECOMMENDATION 20

The Congress and the North Dakota State Legislature should:

1. *Enact laws and provide funding for accelerated programs in acquiring and publishing environmental base data such as air and water quality, effects of interaction between man and his environment, environmentally sensitive areas, and beneficial effects of various elements of the environment.*
2. *Be encouraged to fund projects with negative net national economic development benefits, but high net environmental quality benefits Such a move would reassure the people that the environmental quality objective is more than a "make work" for planners concept Once such a landmark decision is made the precedent should be implemented*
3. *Expand funding for air quality sampling network along with research for regional air quality modeling.*
4. *Enact legislation for stringent State and Federal reclamation and environmental laws.*

Wyoming

RECOMMENDATION 18

The Congress is urged to:

1. *Enact laws and provide funding for accelerated programs in acquiring and publishing environmental base data such as air and water quality, effects of interaction between man and his environment, environmentally sensitive areas, and beneficial effects of various elements of the environment.*
2. *Enact appropriate legislation and funding for developing and publishing environmental projections under various assumptions about economic variables.*

RECOMMENDATION 19

The Congress and the Wyoming State Legislature should be encouraged to fund projects with negative net NED benefits, but high EQ benefits. Such a move would reassure the people that the EQ objective is more than a "make work" for planners concept. Once such a landmark decision is made, the precedent should be implemented

RECOMMENDATION 20

The Wyoming State Legislature should provide for full disclosure of the environmental impacts of substantial actions for other than federally-funded developments when that action.

1. *causes significant damage to the environment,*
2. *is not already subject to the NEPA, and*
3. *is subject to State funding or State administrative review*

North Dakota, continued

RECOMMENDATION 21

The North Dakota State Legislature should enact statewide environmental legislation which would require preservation of natural features of major importance and assessment of public proposals having significant impact on the environment.

RECOMMENDATION 22

The appropriate legislative and approval authority should be urged so that.

1. *Appropriate agencies dealing in impact assessment and those preparing environmental impact studies are required to develop systems for quantifying heretofore unquantified economic and social effects of pollution and environmental damage. Further, State environmental assessment programs should place emphasis on the quantification of environmental and social impacts and related effects rather than the socioeconomic impacts only.*

2. *Federal and State agencies that deal directly with environmental concerns are not permitted to be inactive participants in planning efforts such as this level B.*

Wyoming, continued

RECOMMENDATION 21

The appropriate legislative and approval authority should be urged so that:

1. *Federal and State agencies that deal directly with environmental concerns are directed to be active participants in planning efforts, such as the level B.*

2. *Research that attempts to place a dollar or quantitative value on environmental factors is encouraged and funding for such research needs is expanded. The more environmental amenities that realistically can be placed on a common scale, the easier and more effective comparisons for planning can be.*

3. *The appropriate State agencies look at regional air quality impacts to evaluate the possible cumulative effects of separate potential pollution sources. When airshed limits are reached, further significant developments should be banned unless then-available technology permits point-source air pollution from a proposed facility to be reduced to zero under normal operating conditions.*

Updating the Plan

The recommended plan as developed should not be considered rigid or inflexible. It is based on existing or current information and will require updating as goals, objectives, and needs change and as new information becomes available.

Flexibility

The recommended plan is flexible and can be adjusted under the Missouri River Basin Commission's Comprehensive, Coordinated, Joint Planning Process.

Limitations

The water and related land resources of the study area have been fairly well determined. These resources impose limits on the flexibility of the resource management alternatives.

Responsibility

The responsibility for updating this plan should be a coordinated effort between the States of Montana, North Dakota, and Wyoming and the Missouri River Basin Commission. Vehicles for updating the plan already exist in the ongoing State water planning programs and the Missouri River Basin Commission's Comprehensive, Coordinated, Joint Planning Process.

Responsibility for updating individual project or program elements rests with the sponsoring agency. Changes in the plan should be coordinated through the Missouri River Basin Commission and the affected State or States.

APPENDIX
COMMENTS FROM OFFICIAL REVIEW

Public Law 89-80 requires that before the Commission submits a comprehensive joint plan or major portion thereof or revision thereof to the U.S. Water Resources Council,

> *". . . it shall transmit the proposed plan or revision to the head of each Federal department or agency, the Governor of each State, and each interstate agency, from which a member of the commission has been appointed, and to the head of the United States section of any inter-boundary water or a river crossing a boundary, or any tributary flowing into such boundary water or river, over which the international commission has jurisdiction or for which it has responsibility. Each such department and agency head, Governor, interstate agency, and United States section of an international commission shall have ninety days from the date of the receipt of the proposed plan, portion, or revision after considering the reports so submitted. The views, comments, and recommendations submitted by each Federal department or agency head, Governor, interstate agency, and United States section of an international commission shall be transmitted to the Council with the plan, protion, or revision; . . .*

Prior to initiating the required official review, the Missouri River Basin Commission adopted the report on the Yellowstone River Basin and Adjacent Coal Area as part of the Commission's Comprehensive, Coordinated, Joint Plan for the Missouri River Basin. The Commission instructed that upon completion of the official review, the Chairman shall append the official comments received to the report.

The ninety-day review was initiated on July 12, 1978. All letters of official comment received from that review are included in this appendix. Some transmitted specific comments which are not reproduced here, but are on file at the Commission headquarters. Comments suggesting editorial improvements, or which could be incorporated without changing the substance of the report adopted by the Commission, have been included in this document.

OFFICE
OF
PLANNING
AND
PROGRAMMING

STATE OF NEBRASKA

BOX 94601 · STATE CAPITOL · LINCOLN, NEBRASKA · 68509 · (402) 471-2414

Governor J. James Exon
State Planning Officer

Jon H. Oberg
Director

August 17, 1978

Mr. John E. Acord, Acting Chairman
Missouri River Basin Commission
Suite 403
10050 Regency Circle
Omaha, Nebraska 68114

Dear Mr Acord:

The Governor's Office has requested that the State Planning Office conduct a review of the Yellowstone Level B Study. In general many of the resource issues discussed will not have a direct impact on Nebraska. However, the Yellowstone Level B Study does provide some data on the spin-off impacts which are definitely a concern to Nebraska. Such spin-off impacts as increased rail traffic, possible coal slurry pipelines and increased competition for water between agriculture and energy are of great concern to the state. Highlighting those issues would make the Yellowstone Level B a more valuable document from Nebraska's perspective, eventhough the state is outside of the primary area.

Comments on the specific projects, etc., would not be in order due to our unfamiliarity with them. However, the data base and issues discussed in the Yellowstone Level B should be of considerable use to the people of the Yellowstone Basin in the future.

Sincerely,

Warren G. White

Warren G. White
Natural Resources Coordinator

WGW:jkh

cc: Tom Eason
Dayle Williamson
John Neuberger

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION VII
FEDERAL BUILDING
601 EAST 12TH STREET
KANSAS CITY, MISSOURI 64106

OFFICE OF
PRINCIPAL REGIONAL
OFFICIAL

August 30, 1978

Mr. John E. Acord, Acting Chairman
Missouri River Basin Commission
Suite 403
10050 Regency Circle
Omaha, Nebraska 68114

Dear Mr. Acord:

This is in response to your letter of July 12, 1978 transmitting the Draft Report and Environmental Assessment of the Yellowstone River Basin and Adjacent Coal Area Level B study, requesting our views, comments and recommendations.

As HEW's representatives on the MRBC we have no additional comments and approve the draft report for final preparation and transmission to the U.S. Water Resources Council. Our concerns are for the protection of human beings, health and educational facilities, and water supplies against the hazards of floods.

Although we have no comment on the report we wish to continue serving as HEW's representative on the MRBC and in the water resource development of the Missouri River Basin. In particular, we are interested in how it impacts on society by requiring changes to our programs, facilities and efforts.

Sincerely,

James R. Bergfalk
Acting Principal Regional Official

cc: Joseph Califano, Jr.
Secretary of Health, Education, and Welfare

STATE OF KANSAS

OFFICE OF THE GOVERNOR
State Capitol
Topeka

ROBERT F BENNETT
Governor

September 5, 1978

Mr. John E. Acord
Acting Chairman
Missouri River Basin Commission
Suite 403, 10050 Regency Circle
Omaha, Nebraska 68114

Dear Mr. Acord:

This will acknowledge your transmittal of the Level B Study, Yellowstone River Basin and Adjacent Coal Area, for formal review. I am advised by the Kansas Water Resources Board that the study is of concern primarily to the states of Wyoming, Montana and North Dakota. It would not appear that the interests of Kansas would be directly affected. Accordingly, on behalf of the State of Kansas, I would have no direct comments to offer and would feel that the views of the affected states should govern future actions on the Level B Study.

The Kansas Water Resources Board is the designated agency to represent the state on matters of this nature and their representatives also serve the Commission as a member and alternate. If further information or assistance is needed in this regard, I would suggest you contact the Executive Director of the Board.

Very sincerely,

Robert F. Bennett
Governor of Kansas

RFB:rs

cc: Kansas Water Resources Board

EXECUTIVE OFFICE
STATE OF MISSOURI
JEFFERSON CITY

JOSEPH P. TEASDALE
GOVERNOR

September 18, 1978

Mr. John E. Acord, Acting Chairman
Missouri River Basin Commission
Suite 403, 10050 Regency Circle
Omaha, Nebraska 68114

Dear Mr. Acord:

This is in answer to your request for review of the Yellowstone River Basin and Adjacent Coal Area Level B Study.

The Plan recommendations, in general, are for meeting the needs of agriculture, municipalities, the energy industry, outdoor recreationists, and the environment in the Yellowstone Basin areas of Montana, North Dakota, and Wyoming. The recommendations are chiefly the concerns and responsibilities of those three states and the federal government.

Missouri's concern is with the impacts of stream depletion on downstream users. The Plan does not describe or acknowledge the impact of continued consumptive water use on downstream states; there is no mention of the impact of declining Yellowstone River flows on downstream Missouri River states.

In that respect, the environmental assessment of the report is deficient and inadequate.

What is needed, first, is the recognition of the downstream consequences where plans are made to increase consumptive use in the upper Missouri River basin. Then, an analysis is needed of the economic, social, and environmental costs in the lower basin states when greater consumptive water use is planned upstream--including the Yellowstone basin. This kind of information is needed before valid decisions can be made in the Missouri River Basin regarding future water allocation in this plan.

Thank you for the opportunity to comment on this final draft of the report. Our state is willing to work with the other members of the Missouri River Commission to remedy the report's deficiencies.

Sincerely,

Joseph P. Teasdale
GOVERNOR

JPT:cw
cc: Department of Natural Resources

DEPARTMENT OF THE ARMY
OFFICE OF THE UNDER SECRETARY
WASHINGTON, D.C. 20310

22 SEP 1978

Mr. John E. Acord
Acting Chairman
Missouri River Basin Commission
Suite 403, 10050 Regency Circle
Omaha, Nebraska 68114

Dear Mr. Acord:

This is in response to your 12 July 1978 letter to the Secretary of the Army transmitting for review and comment the final draft report on the Yellowstone River Basin Level B Study.

We offer the following comments. While Chapter 4 presents a detailed estimate of future water "needs" for municipal, rural domestic, livestock, and energy and nonenergy industrial purposes, it does not address projected irrigation water needs. In view of the sizeable acreages projected for irrigation, we feel an estimate of water demand should be included. Additionally, we feel that an expanded description of potential hydropower development would be appropriate in view of recent emphasis on this source of power.

I appreciate this opportunity to comment on your draft report and wish to acknowledge the important contributions of the Missouri River Basin Commission in formulating a comprehensive plan for the conservation, development, and management of the water and related resources of the Yellowstone River Basin and adjacent coal areas in Montana, Wyoming, and North Dakota.

Sincerely,

Michael Blumenfeld
Deputy Under Secretary

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
REGIONAL OFFICE
ROOM 300, FEDERAL OFFICE BUILDING, 911 WALNUT STREET
KANSAS CITY, MISSOURI 64106

October 10, 1978

REGION VII

IN REPLY REFER TO
7C

Mr. John E. Acord
Acting Chairman
Missouri River Basin Commission
10050 Regency Circle - Suite 403
Omaha, Nebraska 68114

Dear Mr. Acord:

Please accept this letter as the official Departmental response to your request for review and comment on the Final Draft Report and Environmental Assessment, Yellowstone River Basin and Adjacent Coal Area Level B Study. I have conducted a review of the subject study and coordinated my review with Ms. Betty Miller, Regional Administrator, Department of Housing and Urban Development (HUD), Region VIII, Denver, Colorado. Her office has responsibility for administering the Department's programs within the geographical area under study; i.e., the Yellowstone River Basin and Adjacent Coal Area.

As a result of our consolidated review, I am pleased to report that the Department has no substantive concerns regarding the nature or findings of the subject study. Our only comment is that the Department has a sincere interest in the evolving growth of these targeted energy impact areas. As a result, HUD will be monitoring the activities in the Yellowstone River Basin and Adjacent Coal Areas to assess the increasing demands on housing and community development resources.

Thank you for providing me the opportunity to review the study. Should you have further questions or need additional information, please feel free to contact my alternate members, Mr. Gary Ultican (Region VII, Kansas City) at FTS 758-3192; or, Mr. Myron Eckberg (Region VIII, Denver) at FTS 327-3207.

Sincerely,

Thomas J. Fowler

William O. Anderson
Regional Administrator

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS
U.S. COAST GUARD (G-WEP-7/73)
WASHINGTON D C 20590
PHONE: 202-426-3300

•16476/7.b 476

12 OCT 1978

Missouri River Basin Commission
Suite 403
10050 Regency Circle
Omaha, Nebraska 68114

Gentlemen:

On behalf of the Department of Transportation the concerned operating administrations and staff of the U. S. Coast Guard have reviewed the Final Draft Report/Environmental Assessment for the Yellowstone River Basin and Adjacent Area Level B Study. We have neither comments nor objections to offer regarding this project.

The opportunity to review the Final Draft Report/Environmental Assessment is greatly appreciated.

Sincerely,

J. R. KIRKLAND
Captain, U.S. Coast Guard
Chief, Marine Environmental
Protection Division
By direction of the Commandant

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Policy
Washington, D.C. 20230

October 13, 1978

Mr. John E. Acord
Acting Chairman
Missouri River Basin Commission
Omaha, Nebraska 68114

Dear Mr. Acord:

The Department of Commerce review generated few comments on the Missouri River Basin Commission's Yellowstone River Basin Level B Report. I have enclosed for your consideration a summary of the remarks from the National Oceanic and Atmospheric Administration National Weather Service's Central Region Office.

Thank you for the opportunity to provide these comments.

Sincerely,

James W. Curlin

James W. Curlin
Deputy Assistant Secretary
for Policy

Enclosure

STATE OF NORTH DAKOTA

EXECUTIVE OFFICE

BISMARCK

ARTHUR A. LINK
Governor

October 17, 1978

Mr. John E. Acord
Acting Chairman
Missouri River Basin Commission
Suite 403, 10050 Regency Circle
Omaha, Nebraska 68114

Dear Mr. Acord:

Volume I of the Yellowstone River Basin and Adjacent Coal Area Level B Study has been reviewed by the staff of the State Water Commission and other North Dakotans expressing an interest in the study, including members of the State Study Team. Comments, if any, from those participating in the study were to be sent directly to the Commission.

The emphasis of the review performed by the State Water Commission was directed to the question of whether or not the Main Report accurately summarizes and reflects the contents of Volume 6, The North Dakota Tributaries Report. I am advised that it does and, as a consequence, have no substantive comments to offer.

I am personally convinced that those North Dakotans who were interested enough to participate actively throughout the study had something to say about how they viewed their state and its natural resources. Moreover, I am quite certain, that as a result, we all understand the issues more fully.

Sincerely yours,

Arthur A. Link

Arthur A. Link
Governor of North Dakota

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20250

October 1 1978

Mr. John E. Acord
Acting Chairman
Missouri River Basin Commission
10050 Regency Circle, Suite 403
Omaha, Nebraska 68114

Dear Mr. Acord:

This is in reply to your letter of July 12, 1978, transmitting for our review and comment your Level B study report on water and related land resources of the Yellowstone River Basin and Adjacent Coal Area in Montana, North Dakota, and Wyoming.

The report is well prepared and presents a comprehensive inventory of water resources problems, needs, and possible solutions. In particular, it does an excellent job of providing information on agriculture and the comparison of impacts of the various plans.

We note that limitations in undertaking the development of new data prevented a comprehensive development of some subjects, especially evident regarding environmental considerations. Reference should be made to the Surface Mining Control Reclamation Act of 1977 (Public Law 95-87) and to the Rural Clean Water Program (Public Law 95-217).

The report could be further strengthened by adding a summary emphasizing the major elements of the recommended plan and the recommendations for implementation.

There are several concerns which remain with the companion documents (volumes 2 through 8). These will be addressed at the time of their official 90-day review.

The Department's specific comments are enclosed for your use.

Sincerely,

Bob Bergland
Bob Bergland
Secretary

Enclosure

IOWA
CONSERVATION COMMISSION

FRED A. PRIEWERT, Director
Wallace State Office Building, Des Moines, Iowa 50319
515/281-5145

An EQUAL OPPORTUNITY Agency

October 19, 1978

John E. Acord, Acting Chairman
Missouri River Basin Commission
Water Resources Division
Dept. of Natural Resources & Conservation
32 South Ewing
Helena, MT 59601

Dear John:

We appreciate the opportunity to review and comment on the Yellowstone River Basin and adjacent coal area level B Study. The focus of major problems, needs and issues in the study area over the next twenty-five year period certainly seemed appropriate in view of the energy status. Major resource area information within the Missouri River Basin, including this major coal resource, is significant to Iowa.

Full implementation would increase water depletions approximately 1.2 million acre feet annually. The water marketing analysis in 1974 pointed out that "Any amount of water up to 3,000,000 acre feet for which potential industrial users can demonstrate a legitimate need is currently available for marketing". This study data falls within those projected criteria limits. Water management can do much to alleviate water problems, however we feel the downstream water needs must also continue to be met. Our position has always been that the average annual stream flow of the Missouri River at Sioux City, Iowa must be 21.2 million acre feet.

Sincerely,

William C. Brabham, Iowa Member
Missouri River Basin Commission

WCB/fb
cc: Governor Ray
Jim Webb
Fred Priewert

FELIX L. SPARKS
Director

LAREN D. MORRILL
Deputy Director

RICHARD D. LAMM
Governor

DEPARTMENT OF NATURAL RESOURCES
COLORADO WATER CONSERVATION BOARD
823 STATE CENTENNIAL BUILDING
1313 SHERMAN STREET
DENVER, COLORADO 80203

TELEPHONE
(303) 839-3441

October 20, 1978

Mr. John E. Acord
Acting Chairman
Missouri River Basin Commission
10050 Regency Circle, Suite 403
Omaha, Nebraska 68114

Dear Mr. Acord:

This is in response to your letter of July 12, 1978 to Governor Richard D. Lamm concerning the draft Report and Environmental Assessment, Yellowstone River Basin and Adjacent Coal Area Level B Study, dated May 1978.

Pursuant to the request by the Governor's Office, the Colorado Water Conservation Board staff reviewed the report from the standpoint of its relationship to the state of Colorado.

Since the area studied in the report and the proposals outlined therein will have no affect on Colorado, we have no comments to offer.

Very truly yours,

Felix L. Sparks
Director

FLS:mm

Department of Energy
Washington, D.C. 20545

OCT 27 1978

Mr. Millard W. Hall, Chairman
Missouri River Basin Commission
Suite 403
10050 Regency Circle
Omaha, Nebraska 68114

Dear Mr. Hall:

This is in reply to a letter dated July 12, 1978, from John E. Acord, Acting Chairman, Missouri River Basin Commission, to Secretary Schlesinger requesting comments on the draft report and environmental assessment for the Yellowstone Level B Study conducted by the Missouri River Basin Commission.

We have reviewed this report and have no major adverse comments. The study appears to be very well done, however, some detailed staff review comments are enclosed for your consideration in finalizing the report.

Thank you for the opportunity to review this study.

Sincerely,

James L. Liverman

James L. Liverman
Deputy Assistant Secretary
for Environment

Enclosure:
As stated

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

NOV 8 1978

PEP ER 78/777

Mr. John E. Acord
Acting Chairman
Missouri River Basin Commission
10050 Regency Circle, Suite 403
Omaha, Nebraska 68114

Dear Mr. Acord:

This is in response to your letter of July 12, 1978, addressed to the Secretary requesting his review of the Level B Study for the Yellowstone River Basin and Adjacent Coal Area. We have completed the review and this letter constitutes the views and comments of the Department of the Interior.

General Comments

The report appears to reflect a thorough effort to accomplish what the study management group determined should be done. However, we believe the procedures followed are not totally in conformance with the Principles and Standards for Planning Water and Related Land Resources (P&S). For example, the P&S specify only two planning objectives - to enhance national economic development (NED) and to enhance environmental quality (EQ). This Level B study includes an implicit third planning objective entitled State-Regional Development (SRD).

We believe that development of an alternative plan emphasizing a SRD objective could result in recommendation of projects having local benefits and national costs. The SRD plan contains projects which would bring to local communities economic benefits in the form of increased income, improved services and induced business activity. However, as indicated on page 174 of the study report, there may be (and presumably are) regional (and national?) costs incurred as a result of development that have neither been evaluated nor reflected in the NED costs. Nevertheless, SRD plan items appear in the recommended plan (for example, see page 186, the Buffalo Bill Enlargement).

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

Further, the first step in the plan formulation process described in the P&S is to specify components of the objectives relevant to the planning setting. No components relative to the Yellowstone River Basin are identified in the study report. This omission is a critical defect because objective components relative to the Yellowstone River Basin must be identified so that planners can develop proposals to achieve the objectives. Without specific objectives, planning cannot occur. The so-called plan formulation consisted of reviewing projects previously proposed or already planned and segregating them into three lists entitled NED, EQ, and SRD according to the dominant type of benefits that each project would produce. A recommended list is formulated by making trade-offs among the three lists. We do not believe that this constitutes a plan.

The study report reveals that effects of the recommended plan would be reduction of employment in the Yellowstone Basin in the year 2000 from 68,700 (without a plan) to 26,620; a reduction of population from 735,210 to 657,060; and a significant shift in land use from rangeland to irrigated cropland, strip mining, water areas and recreation lands. Comparison of these anticipated effects with planning objectives is impossible because no specific planning objectives were established. In fact, the effects seem not to have been intentional but just happened to be the sum of the effects of the projects on the recommended lists. There is no way to evaluate such planning.

The product of the Yellowstone River Basin Level B study is the listing of projects to produce a variety of benefits for each of the seven planning areas within the overall study area. It tends to be more of a project justification document than a plan for management of the water resources within the Yellowstone River Basin.

The Yellowstone study is typical of other recently completed Level B studies in this regard. Apparently, identification of regional planning goals is an extremely difficult process. However, we believe that they must be identified to guide plan formulation and eventual plan evaluation.

Specific Comments ...*(the specific comments provided are on file at the MRBC office)*...

We hope these comments will be of assistance to your efforts.

Sincerely,

Larry E. Meierotto

Deputy Assistant SECRETARY

Enclosures

State of Montana
Office of The Governor
Helena, 59601

THOMAS L. JUDGE
GOVERNOR

November 21, 1978

Mr. Wayne Hall, Chairman
Missouri River Basin Commission
Suite 403, 10050 Regency Circle
Omaha, Nebraska 68114

Dear Mr. Hall:

It is obvious that a tremendous amount of work has gone into the Final Draft Yellowstone River Basin and Adjacent Coal Area Level B Study, and the Missouri River Basin Commission is to be commended for evaluating water resources in that basin. As you know, Montana could not become as deeply involved in this effort as we originally planned. Even so, our efforts on the Management Board, State Study Team, and Ad Hoc Groups were significant in light of pressing on-going programs, particularly the water reservation process in the Yellowstone River Basin. State input was also reduced in part due to the delays in study initiation and funding.

The water reservations adopted by the Board of Natural Resources and Conservation this December will, to a large degree, establish future water use patterns in the Yellowstone River Basin. The Board's action on instream flow requests in particular will determine the additional amount of water development that can occur in the future. The recommended plan for Montana in the Yellowstone Level B Study obviously does not reflect the Board's future decision, making it impossible to use the Level B plan as the state water plan in that basin.

Because of the water reservation process and the fact that hydrologic evaluations were not available when needed, the State Study Team was unable to formulate a recommended plan based on tradeoff analysis and compromise between instream and consumptive water use values. Consequently, the recommended plan for Montana shown in the final draft contains plan elements that are mutually exclusive. That is, implementation of the instream flow recommendations would preclude the full realization of water development elements also included in the recommended plan, and vice versa.

For these reasons, Montana cannot endorse the recommended plan for our state. However, it may be possible for us to accept the report as long as it is clearly understood that we do not endorse each element in the plan.

The Level B study analyzes water resources issues, yet the discussion of water use impacts in Chapter 8 is extremely superficial and could even be misleading. An expansion of that section is essential to properly and adequately portray the effects of instream flows and/or development on streamflows.

Mr. Wayne Hall
Page Two
November 21, 1978

I have attached specific comments on the Level B study drafted by the Department of Natural Resources and Conservation.

Sincerely,

TED SCHWINDEN
Acting Governor

Enclosure

cc: Ted Doney, Director, Department of Natural Resources & Conservation
Jack Acord, Water Resources Division, DNR

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

State Engineer's Office

BARRETT BUILDING CHEYENNE, WYOMING 82002

WYOMING WATER PLANNING PROGRAM

November 29, 1978

Dr. Wayne Hall, Chairman
Missouri River Basin Commission
10050 Regency Circle, Suite 403
Omaha, Nebraska 68114

Dear Dr. Hall:

This is in response to the MRBC request for comments on the Yellowstone River Basin and Adjacent Coal Area Level B Study.

Comments were provided to the Assistant Study Manager for Wyoming on Report Volumes 7 and 8 covering the Wind-Bighorn-Clarks Fork and Northeast Wyoming Areas, respectively.

The study as represented in the Final Draft Report and Environmental Assessment is a very good effort at trying to integrate the economic, hydrologic, energy, recreation and fish and wildlife interests and concerns into a regional study. The study is based on the Harza report, "Analysis of Energy Projections and Implications for Resource Requirements", and reflects the future only as well as Harza was able to predict the future with their linear programming model.

The study was conducted under the guidance of local diverse membership citizen committees. The result is that many tradeoffs and problems are identified but are not resolved; however, the local citizens should be commended for their efforts to make the study reflect the areas' values and feelings.

In the recommendation section of the report there are some areas that need clarification.

Wyoming Recommendation 2: "The Wyoming State Legislature should pass legislation that would: (1) Provide a legal basis for management of water levels in newly built reservoirs to provide minimum practicable daily and seasonal fluctuation in reservoir (and streamflow) levels, where minimum pool levels are a basis for benefits."

While this is perhaps a desirable end to accomplish, imposition of strict arbitrary rules could alter the project's capacity to perform its beneficial purposes. Benefits assigned to the provision of a minimum pool apply only to the minimum pool level and restrictions of seasonal reservoir level fluctuation to levels above the minimum pool level would reduce the ability of the reservoir to

function as planned and to repay its cost. Problems could result in operating the reservoir to provide for unusual weather conditions such as for flood damage reduction or to provide additional water during drought.

Wyoming Recommendation 11: "The Wyoming State Legislature should pass legislation that would: (2) Provide authority for an appropriate regulatory agency to adopt and inforce minimum flow regulations for selected streams, after due consideration of all potential and foreseeable beneficial uses of the streams."

The Constitution of the State of Wyoming declares all of the waters of the State to be property of the State and charges the State Engineer with administering these waters. The State Engineer through the water commissioners can now supervise the delivery of stored water to maintain instream values if this is a project purpose. The State Engineer is also charged with planning for the orderly development of the State's water and recent studies in the Yellowstone study area have included analysis of stream flow maintenance as part of the projects analyzed.

This report is one attempt at trying to view the future and as such it should be used as a planning scenario and not as an ultimate plan. Definite plan elements and potentials are identified in the report and only time and the economics of the energy industry will determine how well the "Recommended Plan" reflects the future.

Sincerely,

George L. Christopulos

George L. Christopulos
State Engineer

GLC:ew

Photo Credits: Bureau of Reclamation, Interior, pp. 4, 27, 38, 40, 55, 56, 62, 71, 75, 150, 245
Forest Service, USDA, pp. 28, 34
National Weather Service, p. 8
Soil Conservation Service, USDA, pp. 72, 73
Montana Department of Highways, pp. 16, 43, 69
Montana Department of Natural Resources and Conservation, pp. 42, 66, 168
North Dakota State Water Commission, pp. cover, x, 6, 23, 52, 57, 64, 88, 90, 91, 126, 192, 247, 248, 250
North Dakota Travel Department, pp. 10, 31, 41, 70, 74
Wyoming Highway Department, pp. 10, 19, 20, 32, 59, 60, 68, 194
Wyoming Department of Economic Planning and Development, pp. 14, 44, 46